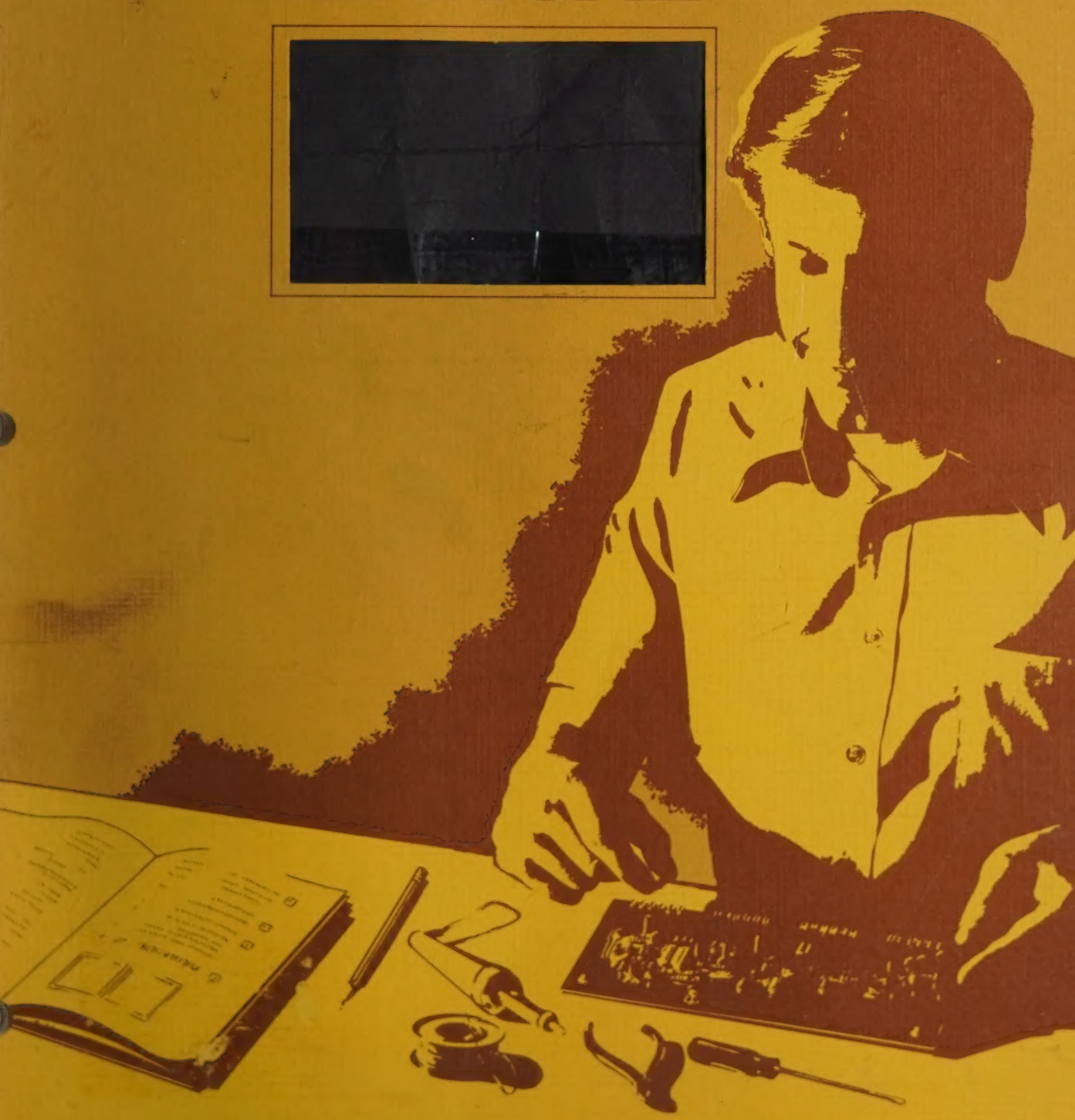
# HEATHKIT® MANUAL



HEATH COMPANY · BENTON HARBOR, MICHIGAN

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The following telephone numbers are direct lines to the departments listed:

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For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

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HEATH COMPANY
BENTON HARBOR, MI. 49022

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

# Heathkit® Manual

*for the*

## DIGITAL COMPUTER

Model H88

ASSEMBLY 595-2267-01

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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# INTRODUCTION

This Heath Digital Computer is a versatile 8-bit microcomputer and professional video terminal both built into the same cabinet. The computing functions and terminal operations are both controlled by Z-80 microprocessors. The high-quality keyboard, video display, state-of-the-art logic circuitry, and plug-in accessories make this Computer outstanding.

Some features of the Computer are:

- Up to 48k bytes of user memory.
- Wired and tested terminal logic circuit board.
- Wired and tested CPU logic circuit board.
- An internal monitor that automatically sizes the memory and initializes the inputs/outputs at power-up. This utilizes 2k bytes of ROM which contains load and dump routines that eliminate the need for bootstrap and loader programs at turn-on.

The information is displayed on a 12" (diagonal), high-quality cathode-ray tube (CRT) that can display 1920 characters at one time (24 rows of 80 characters). The P4 phosphor used in the CRT provides superb character definition. Upper-case characters are formed by a 5 × 7 dot matrix. Lower-case characters that have descenders use a 5 × 9 dot matrix. The Computer can also display 33 special graphic characters that can be arranged and grouped to form any number of graphic displays and effects. The graphic symbols are formed on an 8 × 10 dot matrix.

Special keyboard and software-controllable escape sequences allow you to select and use thirty-two special functions. These include:

- Eight user-defined, special function keys.
- Automatic and manual line, or page, scrolling.
- Cursor control (left, right, up, down, home).

In addition to these special functions, you have the ability to:

- Address the cursor directly.
- Insert and delete characters and lines.
- Enter and exit the graphics and reverse video modes.
- Erase lines or pages of text.
- Modify baud rates.

The highly reliable, standard-size electronic keyboard uses the universally accepted, standard typewriter format. Each key stroke is affirmed by an audible click.

A 12-key keypad duplicates the numeric key in a calculator format. This lets you rapidly enter numbers in programs that call for just numbers. In addition, the shifted keypad functions allow you to insert and delete lines and characters, and move the cursor.

One cassette interface board is supplied with the computer to interface cassette recorders for easy storage of information. This includes automatic turn-on and turn-off of the cassette recorder.

Other accessories that may be added are:

- Additional memory, to expand the memory of the computer up to 48k bytes.
- A floppy disk drive unit and its interface card for storing program material.
- A serial interface card to interface the computer with another computer, a line printer or any EIA RS232 standard.

These features, along with the stylish molded cabinet, make this Heath Digital Computer a versatile and powerful computing center.

# UNPACKING INSTRUCTIONS

This kit is packed in two cartons. The smaller one contains the CRT (Cathode Ray Tube). Do not open this carton until you are instructed to do so.

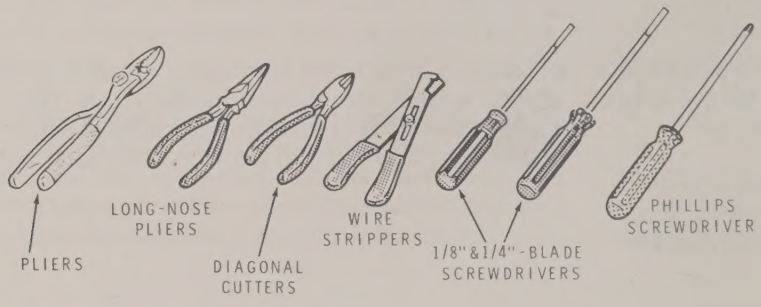
In the large shipping carton, you will find two smaller boxes. One of these boxes contains packs #1 and #2. The other box contains three prewired circuit boards. Set these two boxes aside.

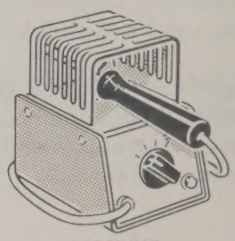
Locate the circuit board in the large shipping carton and set it aside with the two smaller boxes. The remaining parts in the large shipping carton are all part of the Main Pack. You will work from this pack first.

# ASSEMBLY NOTES

## TOOLS

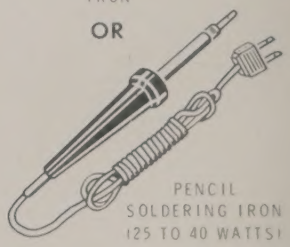
You will need these tools to assemble your kit.



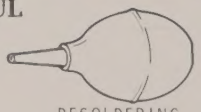
HEATHKIT SOLDERING IRON

OR



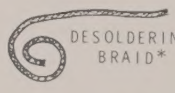
PENCIL SOLDERING IRON (25 TO 40 WATTS)

**OTHER HELPFUL TOOLS**

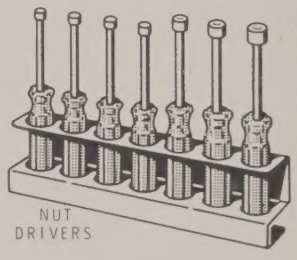


DESOLDERING BULB*

NUT STARTER (MAY BE SUPPLIED WITH KIT)



DESOLDERING BRAID*



NUT DRIVERS

*TO REMOVE SOLDER FROM CIRCUIT CONNECTIONS.

## ASSEMBLY

1. Follow the instructions carefully. Read the entire step before you perform each operation.

2. The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue using that Pictorial until you are referred to another Pictorial for another group of steps.

3. Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.

4. Position all parts as shown in the Pictorials.

5. Solder a part or a group of parts only when you are instructed to do so.

6. Each circuit part in an electronic kit has its own component number (R2, C4, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

   — In the Parts List,

   — At the beginning of each step where a component is installed,

   — In some illustrations,

   — In the Schematic,

   — In the section at the rear of the Manual.

7. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

**SAFETY WARNING: Avoid eye injury when you cut off excess lead lengths. Hold the leads so they cannot fly toward your eyes.**

## SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

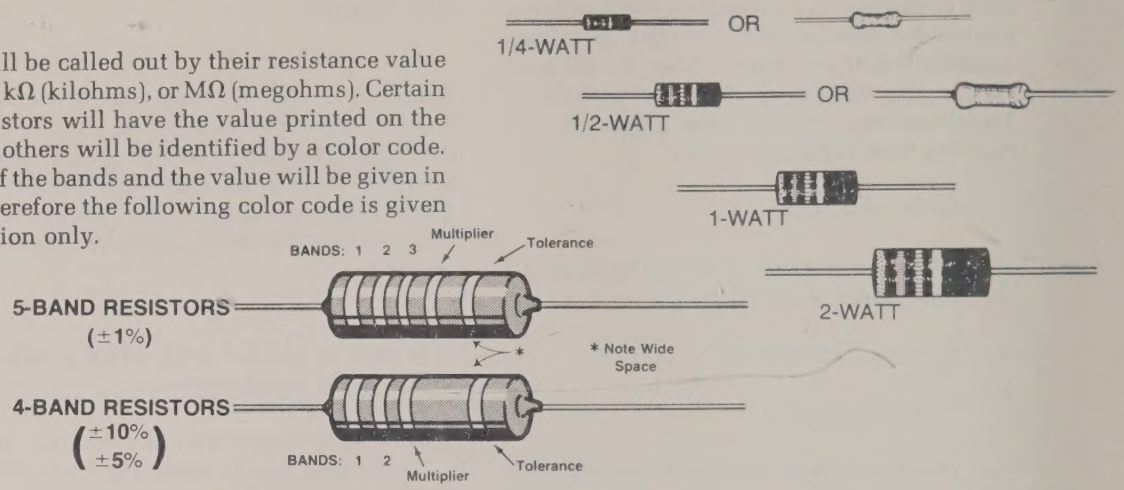
It is easy to make a good solder connection if you follow a few simple rules:

1. Use the right type of soldering iron. A 25 to 40-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.

2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

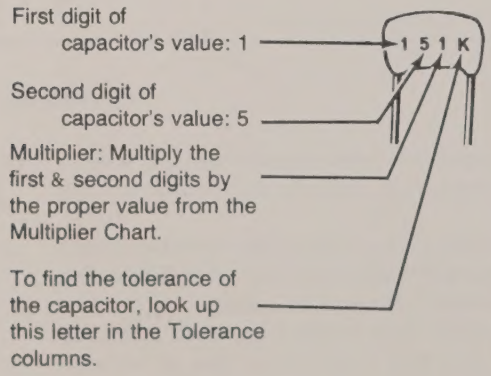
## PARTS

**Resistors** will be called out by their resistance value in Ω (ohms), kΩ (kilohms), or MΩ (megohms). Certain types of resistors will have the value printed on the body, while others will be identified by a color code. The colors of the bands and the value will be given in the steps, therefore the following color code is given for information only.




| Band 1 1st Digit | | Band 2 2nd Digit | | Band 3 (if used) 3rd Digit | | Multiplier | | Resistance Tolerance | |
|---|---|---|---|---|---|---|---|---|---|
| Color | Digit | Color | Digit | Color | Digit | Color | Multiplier | Color | Tolerance |
| Black | 0 | Black | 0 | Black | 0 | Black | 1 | Silver | ±10% |
| Brown | 1 | Brown | 1 | Brown | 1 | Brown | 10 | Gold | ± 5% |
| Red | 2 | Red | 2 | Red | 2 | Red | 100 | Brown | ± 1% |
| Orange | 3 | Orange | 3 | Orange | 3 | Orange | 1,000 | | |
| Yellow | 4 | Yellow | 4 | Yellow | 4 | Yellow | 10,000 | | |
| Green | 5 | Green | 5 | Green | 5 | Green | 100,000 | | |
| Blue | 6 | Blue | 6 | Blue | 6 | Blue | 1,000,000 | | |
| Violet | 7 | Violet | 7 | Violet | 7 | Silver | 0.01 | | |
| Gray | 8 | Gray | 8 | Gray | 8 | Gold | 0.1 | | |
| White | 9 | White | 9 | White | 9 | | | | |

**Capacitors** will be called out by their capacitance value in μF (microfarads) or pF (picofarads) and type: ceramic, Mylar*, electrolytic, etc. Some capacitors may have their value printed in the following manner:


First digit of capacitor's value: 1
Second digit of capacitor's value: 5
Multiplier: Multiply the first & second digits by the proper value from the Multiplier Chart.
To find the tolerance of the capacitor, look up this letter in the Tolerance columns.
1 5 1 K

EXAMPLES:

151K = 15 × 10 = 150 pF
759 = 75 ×0.1 = 7.5 pF

NOTE: The letter "R" may be used at times to signify a decimal point: as in: 2R2 = 2.2 (pF or μF).

| MULTIPLIER | | TOLERANCE OF CAPACITOR | | |
|---|---|---|---|---|
| FOR THE NUMBER: | MULTIPLY BY: | 10 pF OR LESS | LETTER | OVER 10 pF |
| 0 | 1 | ±0.1 pF | B | |
| 1 | 10 | ±0.25 pF | C | |
| 2 | 100 | ±0.5 pF | D | |
| 3 | 1000 | ±1.0 pF | F | ±1% |
| 4 | 10,000 | ±2.0 pF | G | ±2% |
| 5 | 100,000 | | H | ±3% |
| | | | J | ±5% |
| 8 | 0.01 | | K | ±10% |
| 9 | 0.1 | | M | ±20% |

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# MAIN PACK

## PARTS LIST

Check the parts in the main pack against this Parts List and the Parts Pictorial (Illustration Booklet, Page 1). Any part that is packed in an individual envelope with a part number on it should not be removed from its envelope until it is called for in a step. Do not discard any packing materials until all parts are accounted for.

To order a replacement part, always include the Part Number and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

**NOTE: For packaging reasons, some parts of the same kind (such as some hardware items) have been located in both the "Electronics" carton and the "Open This Carton First" carton. For this reason, if your parts count is short, check in the other carton.**

### ELECTRICAL COMPONENTS

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| A1 | 25-857 | 1 | 1500 μF electrolytic capacitor | B1 |
| B1 | 54-969 | 1 | Power transformer | T1 |
| B2 | 58-19 | 1 | Yoke | T2 |
| B3 | 60-54 | 1 | 120/240 slide switch | SW1 |
| B4 | 60-608 | 1 | NOR/LOW slide switch | SW2 |
| B5 | 60-619 | 1 | Rocker switch | SW3 |
| C1 | 423-11 | 1 | Fuseholder | |
| C2 | 401-163 | 1 | Speaker | |
| C3 | 420-99 | 1 | Fan | |
| C4 | 51-196 | 1 | Flyback transformer | T202 |
| C5 | 51-197 | 1 | Driver transformer | T201 |

### HARNESS — CABLES — WIRE — SLEEVING

NOTE: The wire pack is located in Pack #1.

| | | | |
|---|---|---|---|
| | 89-54 | 1 | Line cord |
| D1 | 134-1066 | 1 | Flat cable |
| D2 | 134-1067 | 1 | Harness |
| D3 | 134-1075 | 1 | Interconnect cable |
| | 340-8 | 48" | Bare wire |

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| | 343-11 | 8 ft | Shielded cable | |
| | 344-15 | 9 ft | Black stranded wire | |
| | 344-33 | 36" | Black solid wire | |
| | 344-16 | 36" | Red stranded wire (thin insulation) | |
| | 344-183 | 42" | Red stranded wire (thick insulation) | |
| | 344-80 | 45" | Orange standed wire | |
| | 344-81 | 7" | Violet stranded wire | |
| | 344-82 | 7" | White stranded wire | |
| | 344-126 | 48" | Brown stranded wire | |
| | 344-154 | 7" | Yellow stranded wire | |
| | 344-155 | 70" | Green stranded wire | |
| | 344-156 | 7' | Blue stranded wire | |
| | 346-64 | 3" | Large sleeving | |
| | 346-35 | 5 | Black heat shrinkable sleeving | |
| | 346-21 | 1" | White teflon* sleeving | |
| | 346-26 | 7" | Clear sleeving | |
| | 347-55 | 24" | 8-wire ribbon cable | |
| | 347-60 | 8 ft | 2-wire gray cable | |

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## ASSEMBLIES

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| E1 | 64-864 | 1 | 12-key keyboard | |
| E2 | 64-865 | 1 | 4-key keypad (off line, $f_1$, $f_2$, $f_3$) | |
| E2 | 64-866 | 1 | 4-key keypad ($f_4$, $f_5$, Erase, Blue) | |
| E2 | 64-872 | 1 | 4-key keypad (Red, White, Reset, Break) | |
| E3 | 181-3051 | 1 | Keyboard consisting of: | |
| | | *1* | *60-key keyboard* | |
| | | *1* | *Key circuit board* | |
| | | *5* | *#4 × 3/8" self-tapping screws* | |

## HARDWARE

NOTES:

1. The hardware may be in more than one packet. Open all the hardware packets, according to their size, before you check the hardware.
2. Hardware is shown actual size. To identify a piece of hardware, place it over the illustration.

### #4 Hardware

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| F1 | 250-186 | 10 | #4 × 3/8" self-tapping screw | |
| F2 | 252-2 | 4 | 4-40 nut | |
| F3 | 254-9 | 3 | #4 lockwasher | |
| F4 | 255-757 | 4 | #4 Hex spacer | |
| F5 | 259-9 | 1 | #4 solder lug | |

### #6 Hardware

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| G1 | 250-369 | 4 | #6 × 1/4" black sheet metal screw | |
| G2 | 250-56 | 4 | 6-32 × 1/4" screw | |
| G3 | 250-434 | 8 | 6-32 × 3/8" flat head screw | |
| G4 | 250-1264 | 43 | 6-32 × 3/8" hex head screw | |
| G5 | 250-162 | 1 | 6-32 × 1/2" screw | |
| G6 | 250-1275 | 1 | #6 × 5/8" black self-tapping screw | |
| G7 | 250-1296 | 2 | 6-32 × 1-7/8" screw | |
| G8 | 250-1287 | 2 | Detent screw | |

### #6 Hardware (cont'd.)

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| H1 | 252-3 | 7 | 6-32 nut | |
| H2 | 253-96 | 6 | #6 flat washer | |
| H3 | 254-1 | 11 | #6 lockwasher | |
| H4 | 252-725 | 42 | Brass insert (1 extra) | |
| H5 | 259-1 | 2 | #6 solder lug | |
| H6 | 250-1157 | 4 | #6 hex spacer | |
| H7 | 253-28 | 2 | O-ring | |

### #8 Hardware

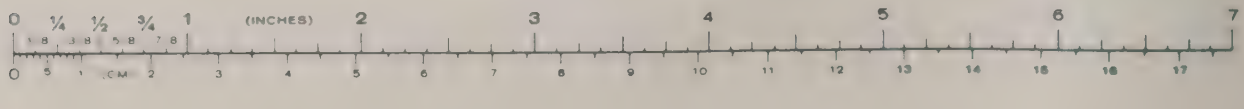
| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| J1 | 250-137 | 1 | 8-32 × 3/8" screw | |
| J2 | 250-72 | 14 | 8-32 × 3/4" screw | |
| J3 | 252-4 | 8 | 8-32 nut | |
| J4 | 253-45 | 10 | #8 flat washer | |
| J5 | 254-2 | 8 | #8 lockwasher | |
| J6 | 259-2 | 2 | #8 solder lug | |
| J7 | 255-66 | 1 | 1-3/8" spacer | |

### #10 Hardware

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| K1 | 250-331 | 4 | 10-32 × 1" screw | |
| K2 | 250-261 | 4 | #10 × 1-1/2" self-tapping screw | |
| K3 | 253-98 | 8 | #10 flat washer | |
| K4 | 259-5 | 3 | #10 solder lug | |
| K5 | 255-753 | 8 | Beveled spacer | |
| K6 | 432-1077 | 1 | Ground connector | |
| K7 | 258-33 | 2 | Spring | |

## BRACKETS — PLATES — CLAMP

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| M1 | 204-2362 | 3 | Keyboard bracket | |
| M2 | 204-2396 | 2 | Circuit board mounting bracket | |
| M3 | 204-2361 | 1 | Bezel mounting plate | |
| M4 | 204-2395-2 | 1 | AC chassis | |
| M5 | 205-1776-1 | 2 | Latch plate | |
| M6 | 205-1775 | 2 | Detent plate (brass) | |
| M7 | 205-1777 | 2 | Front panel mounting plate | |
| M8 | 205-1783-1 | 1 | Connector plate | |
| M9 | 207-86 | 1 | Capacitor mounting clamp | |
| M10 | 215-632 | 1 | Video circuit board heat sink | |
| M11 | 204-2456 | 1 | Accessory mounting bracket | |
| M12 | 205-1781 | 1 | Fan mounting plate | |
| M13 | 204-2454 | 1 | Brace | |



| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|

## CABINET PARTS

| | | | |
|---|---|---|---|
| N1 | 90-1236-1 | 1 | Terminal base |
| N2 | 90-1237-1 | 1 | Cabinet shell |
| N3 | 90-1239-1 | 1 | Front panel |
| N4 | 90-1238-1 | 1 | Keyboard cover |
| N5 | 90-1244-1 | 1 | Bezel cover |
| N6 | 261-6 | 4 | Foot |

## CONNECTORS

| | | | |
|---|---|---|---|
| P1 | 432-148 | 2 | 3-hole male plug |
| P2 | 432-149 | 1 | 3-hole female socket |
| P3 | 432-865 | 1 | Small 3-hole connector shell |
| P4 | 432-954 | 2 | 4-hole connector shell |
| P5 | 432-1022 | 1 | 8-hole connector shell |
| P6 | 432-1061 | 2 | 10-hole connector shell |
| P7 | 432-1053 | 1 | 34-pin plug |
| P8 | 432-866 | 11 | Small spring connector (1 extra) |
| P9 | 432-753 | 41 | Large spring connector (1 extra) |
| P10 | 432-854 | 14 | Small male socket pin |
| P11 | 432-855 | 15 | Small female socket pin |

## TOOLS

| | | | |
|---|---|---|---|
| Q1 | 205-778 | 1 | Alignment tool blade |
| Q2 | 490-1 | 1 | Alignment tool |
| Q3 | 490-5 | 1 | Nut starter |
| Q4 | 490-185 | 1 | Soder Wick* |
| Q5 | 490-189 | 1 | IC puller |

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|

## MISCELLANEOUS

| | | | |
|---|---|---|---|
| | 411-838 | 1 | CRT (packed in separate carton). NOTE: Do not open this carton until you are instructed to do so. |
| | 73-39 | 34" | Long foam gasket |
| R1 | 73-92 | 1 | 3/4" × 5" foam tape |
| R2 | 75-754 | 1 | Line cord strain relief |
| R3 | 75-785 | 1 | Clear switch cover |
| R4 | 265-36 | 2 | Hinge |
| R5 | 266-944 | 15 | Nylon guide |
| R6 | 352-33 | 2 | Vibra-Tite** sealant |
| R7 | 354-5 | 5 | Small cable tie |
| R8 | 354-7 | 2 | Large cable tie |
| R9 | 352-31 | 1 | Thermo compound |
| | 390-1674 | 1 | Model label |
| | 391-34 | 1 | Blue and white label |
| R10 | 440-24 | 1 | Insulator cap |
| R11 | 421-23 | 1 | 1-ampere fuse |
| R11 | 421-25 | 1 | 1.5 ampere fuse |
| R12 | 438-55 | 3 | Small polarizing plug |
| R13 | 438-48 | 7 | Large polarizing plug |
| | 597-260 | 1 | Parts Order Form |
| | | 1 | Assembly Manual (see Page 1 for the part number). |
| | | 1 | Operation Manual (see Page 1 for the part number). |
| | | | Solder |

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**Registered Trademark, Oakland Corp.

# STEP-BY-STEP ASSEMBLY

## TERMINAL BASE ASSEMBLY

Refer to Pictorial 1-1 (Illustration Booklet, Page 3) for the following steps.

( ) Position the terminal base on your work surface as shown.

( ) Refer to inset drawing #1 on Pictorial 1-1 and mount a rubber foot to the underside of the cabinet base at DA with an 8-32 × 3/4" screw, a #8 lockwasher, and an 8-32 nut.

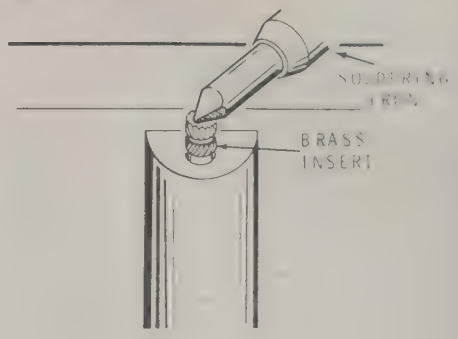
( ) In a similar manner mount rubber feet at DB, DC, and DD.

NOTE: When you install a brass insert, first place the insert into the hole and make sure it is started straight. Then heat the insert with your soldering iron while you apply a slight downward pressure. Install the insert flush with the top of the hole.

Locate 22 brass inserts. Then refer to Detail 1-1A and install these inserts at the following locations.

| | |
|---|---|
| ( ) AA | ( ) AM |
| ( ) AB | ( ) AN |
| ( ) AC | ( ) AO |
| ( ) AD | ( ) AP |
| ( ) AE | ( ) AR |
| ( ) AF | ( ) AS |
| ( ) AG | ( ) AT |
| ( ) AH | ( ) AU |
| ( ) AJ | ( ) AV |
| ( ) AK | ( ) AW |
| ( ) AL | ( ) AX |

NOTE: The Vibra-Tite sealant that you will use in the next step will stain anything it gets on. Be careful that you do not get it on your clothing or on the outside of the terminal base.



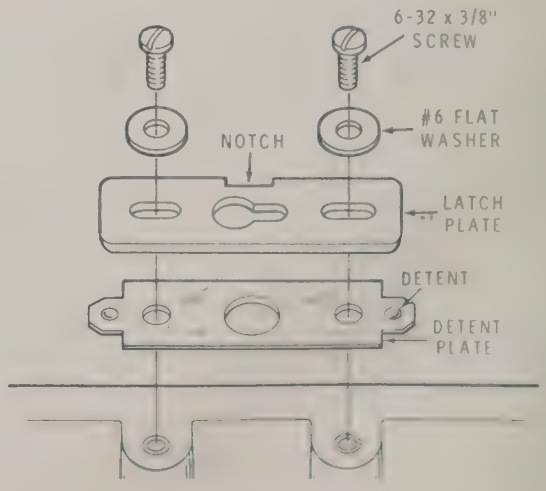

**Detail 1-1A**

( ) Locate a vial of Vibra-Tite sealant and cut off the tip. Then apply a liberal amount of the sealant to the inner threads of the inserts at AA, AB, AC, and AD.

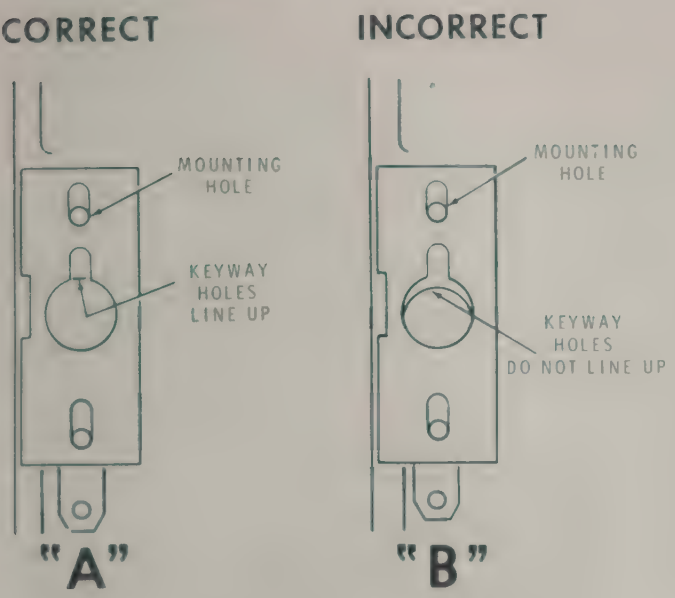
WARNING: The detent plates that you will install in the following steps have sharp edges.

( ) Refer to Detail 1-1B and locate two detent plates. Place these on the terminal base edge at AA/AB and AC/AD. Position the detents up.

( ) Refer again to Detail 1-1B and locate two latch plates. Place these on top of the detent plates with the notch facing the outer edge, and the keyway toward the rear of the terminal base.




**Detail 1-1B**

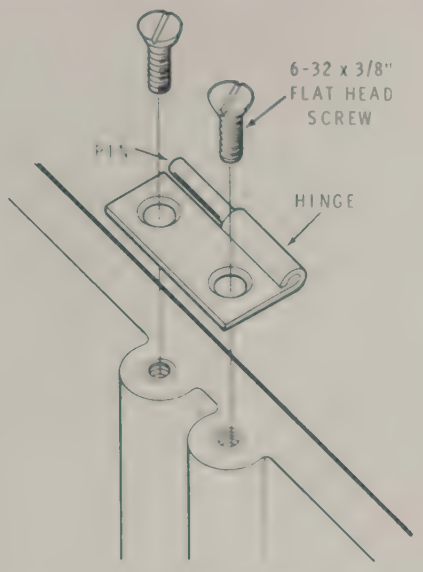



Detail 1-1C

( ) In the next step, before you mount the detent and latch plates, determine the correct positioning of the detent plates as follows:

( ) Refer to Detail 1-1C and align the mounting holes in the plates as shown. Then look at the keyway holes. If the keyway holes in the detent and latch plates are in line as in "A," the detent plate is correctly positioned. If the keyway holes do not line up, as in "B", turn the detent plate end-for-end.

( ) Mount the detent and latch plates with four 6-32 × 3/8" screws and four #6 flat washers. Tighten the hardware and then turn the screw out 1/8-turn.




Detail 1-1D

( ) Locate two hinge halves with pins. Use these in the next two steps.

( ) Refer to Detail 1-1D and mount a hinge half at AN/AO with two 6-32 × 3/8" flat head screws.

( ) In the same manner mount a hinge half at AP/AR.

( ) Locate the power transformer and cut the bare lead ends to 1/8" on the following leads.

Both red leads
Both yellow leads
Both green leads

( ) Cut a 12" black stranded wire and remove 1/4" of insulation from both ends.

Refer to Detail 1-1E (Illustration Booklet, Page 4) for the following steps.

( ) Twist the bare wire at one end of the 12" black wire and the bare end of the green-yellow power transformer lead together. Apply a small amount of solder to hold the wires together.

( ) Cut the bare wire ends of this twisted pair to 1/8".

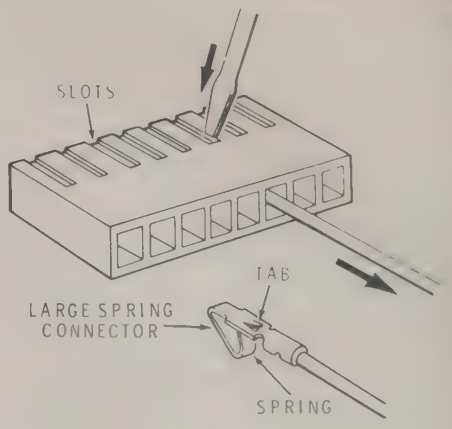
( ) Refer to inset drawing #1 on Detail 1-1E and crimp and solder a large spring connector onto the bare end of the green-yellow transformer lead and black stranded wire pair. Be sure you do not solder the spring part of the connector so that it cannot move freely.

( ) Check your solder connection to make sure it is solid. It should have a smooth shiny appearance. If it is dull or grainy, reheat the connection. Also make sure there is not excessive solder on the connection since it must fit into a small space in the connector shell.

( ) In the same manner, crimp and solder large spring connectors onto the following transformer leads.

Either red lead.
Other red lead.
Either green lead.
Other green lead.
Either yellow lead.
Other yellow lead.

( ) Position the 8-hole connector shell as shown with the slotted side up.




**Detail 1-1F**

NOTE: If it is ever necessary to remove a spring connector from the connector shell, use a small screwdriver to depress the tab on the connector through the slot in the connector shell while you pull on the wire. See Detail 1-1F. For this reason, always install the spring connectors with the tab toward the slotted side of the connector shell.

Refer again to Detail 1-1E and insert the spring connectors into the 8-hole connector shell as follows. Insert each connector until it locks in place.

( ) Either red lead into hole 1.
( ) Other red lead into hole 2.
( ) No lead in hole 3.
( ) Either yellow lead into hole 4.
( ) Other yellow lead into hole 5.
( ) Either green lead into hole 6.
( ) Other green lead into hole 7.
( ) Green-yellow lead and black wire into hole 8.

( ) Gently pull on each wire in the connector shell to make sure the spring connectors are securely locked in place.

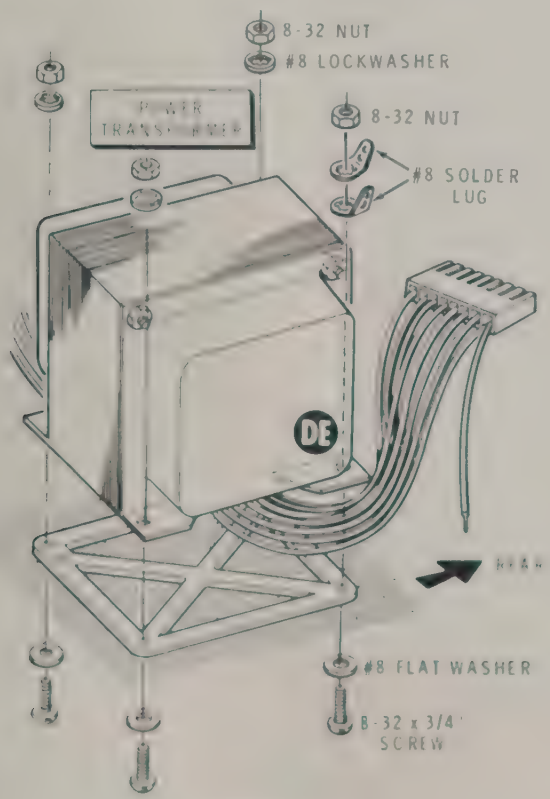
( ) Twist the fine wire strands at the other end of the 12" black wire. Then apply a small amount of solder to hold the strands in place. Cut the bare end of this wire to 1/8".

( ) Refer to inset drawing #2 on Detail 1-1E and crimp and solder a small female socket pin onto the end of the black wire. This socket pin will be installed later.

( ) Refer to Detail 1-1G and position the power transformer into the base at T1 with the red, yellow, and green leads next to the edge of the base. Route the leads toward the rear of the base.

( ) Refer again to Detail 1-1G and mount the power transformer in the cabinet base with four 8-32 × 3/4" screws, four #8 flat washers, three #8 lockwashers, two #8 solder lugs, and four 8-32 nuts. Install all of the hardware before you tighten it. Be sure to position the two solder lugs at DE as shown.

( ) Bend the solder lugs at DE up at a 45° angle.




**Detail 1-1G**

NOTE: When you are instructed to prepare wire, as in the next step, cut it to the indicated length and remove 1/4″ of insulation from each end. For stranded wire, twist together the fine wire strands and apply a very small amount of solder to the bare wire end to hold the strands in place.

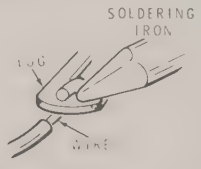
( ) Prepare the following green stranded wires:

15″
10″
13″
12″

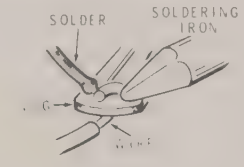
NOTE: When you are instructed to make a connection mechanically secure, as in the next step, first form a hook in the end of the wire. Then insert the hook through the lug and crimp it securely. See Detail 1-1H.

( ) Refer to the following instructions and connect one end of the 15″ green wire to the solder lug at DE nearest the edge of the base. Use the lower hole in the solder lug. Make this connection mechanically secure.

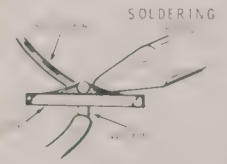
1. Push the soldering iron tip against the wire **and** the lug. Heat both the wire and the lug for two or three seconds.

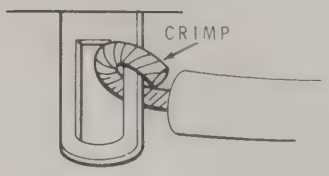



2. Apply solder to the wire and the lug, **not** to the soldering iron. IMPORTANT: Let the heat of the wire and lug melt the solder.



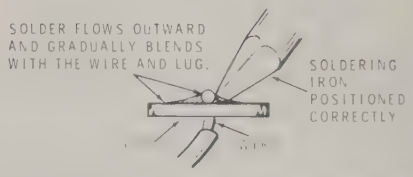

3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



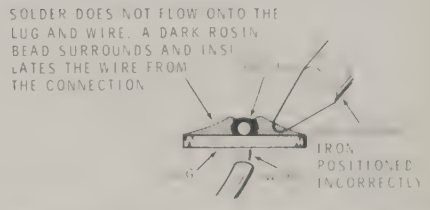

**Detail 1-1H**

## A GOOD SOLDER CONNECTION

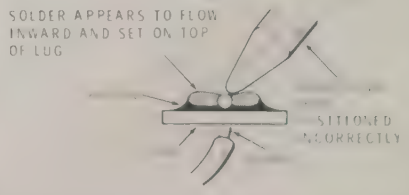



When both the wire and the lug are heated at the same time, the solder will flow onto the wire and the lug evenly. The solder will make a good electrical connection between the wire and the lug.

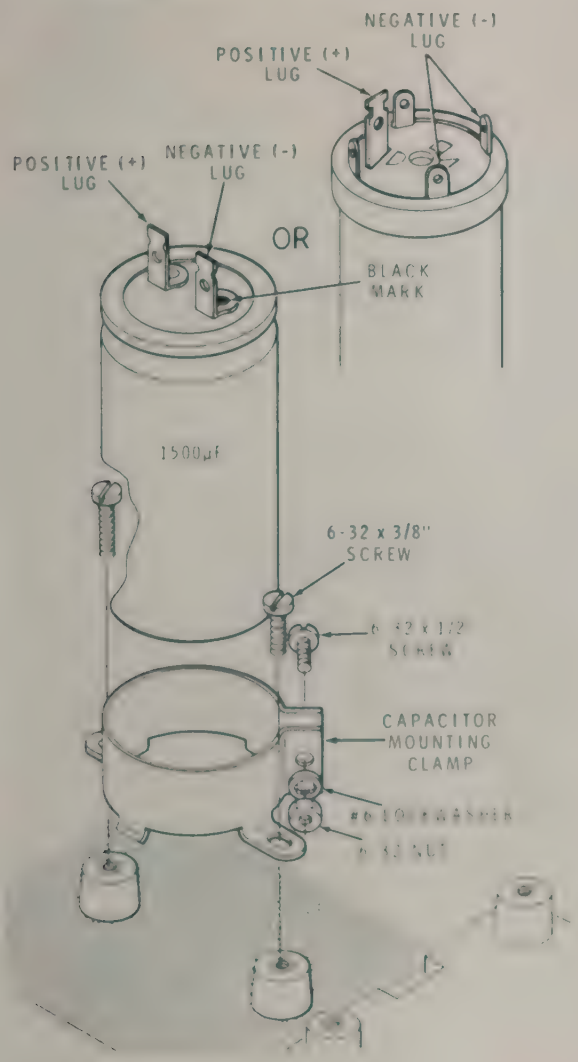
## POOR SOLDER CONNECTIONS


SOLDER DOES NOT FLOW ONTO THE LUG AND WIRE. A DARK ROSIN BEAD SURROUNDS AND INSULATES THE WIRE FROM THE CONNECTION
IRON POSITIONED INCORRECTLY

When the wire is not heated sufficiently, the solder will not flow onto the wire as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.




When the lug is not heated sufficiently, the solder will blob on the lug as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.




**Detail 1-1J**

( ) Solder one end of the 10" green wire to the upper hole in the same solder lug at DE. Route this wire around the power transformer as shown. This wire will be connected later.

( ) Solder one end of both the 13" and 12" green wires to the other solder lug at DE. Then route these wires as shown. The other ends will be connected later.

( ) Route the transformer leads (not connected to the 8-hole connector shell) and the 15" green wire through the hole in the back of the AC housing.

( ) Refer to inset #2 on Pictorial 1-1 and install a small cable tie around these transformer leads and the 15" green wire. Pull the cable tie tight and cut off the excess.

NOTES:

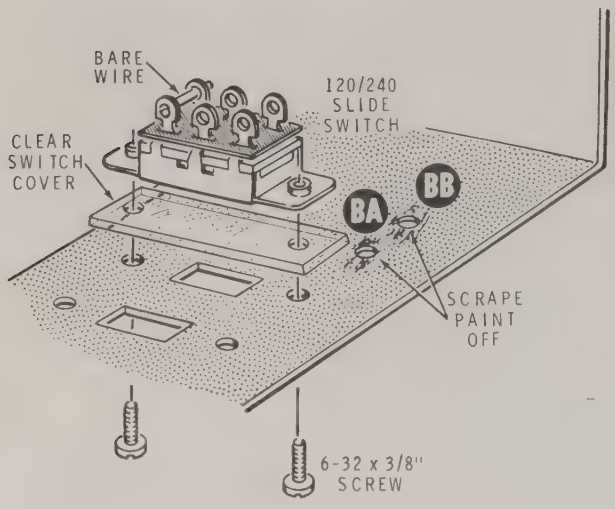
1. In the next step, be sure to position the negative (−) marked lug of the capacitor as shown. This capacitor may look like either style shown.

2. Use the nut starter to hold and start 6-32 and 4-40 nuts on screws.

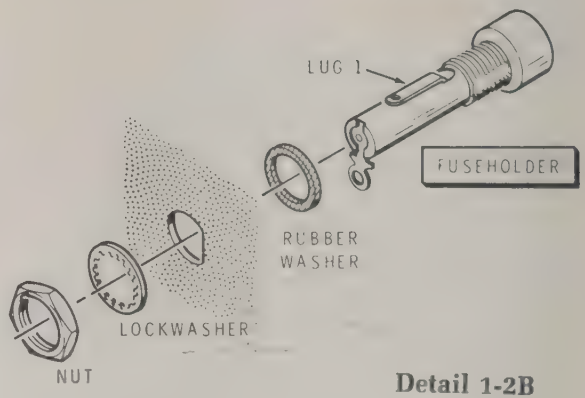
( ) Refer to Detail 1-1J and install the capacitor mounting clamp on the 1500 µF electrolytic capacitor. Use a 6-32 × 1/2" screw, a #6 lockwasher, and a 6-32 nut. Position the clamp around the bottom of the capacitor.

( ) Refer again to Detail 1-1J and mount the capacitor mounting clamp at C1 with two 6-32 × 3/8" screws.

Set the terminal base aside temporarily.




**Detail 1-2A**




**Detail 1-2B**

## AC CHASSIS ASSEMBLY AND WIRING

Refer to Pictorial 1-2 (Illustration Booklet, Page 4) for the following steps.

( ) Locate the AC chassis and position it as shown.

NOTE: If your supply voltage (line voltage) is 120 VAC, set the 120/240 slide switch in the next step so that "120" appears on the slider. If your supply voltage is 240 VAC, set the slider to show "240."

( ) Locate the 120/240 slide switch and set the slider to the appropriate voltage setting for your area.

( ) Refer to Detail 1-2A and mount the 120/240 slide switch and clear switch cover at SW1 with the bare wire positioned as shown. Use two 6-32 × 3/8" screws.

( ) In the same manner, except without the clear switch cover, mount the NOR/LOW (Normal/Low) slide switch at SW2. Set the switch slider so that "NOR" is showing. Refer to inset drawing #1 on Pictorial 1-2 for switch lug orientation.

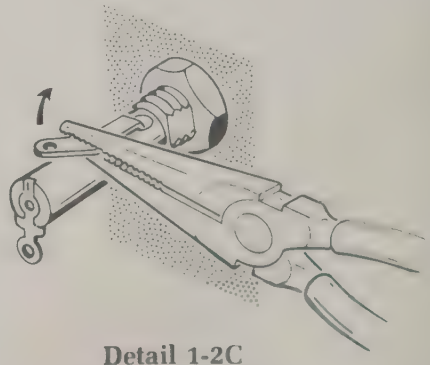
( ) Refer again to Detail 1-2A and scrape the paint off the AC chassis around holes BA and BB.

( ) Mount a #6 solder lug at BA with a 6-32 × 3/8" screw and a 6-32 nut. Position the lug as shown.

( ) In the same manner, mount a #6 solder lug at BB.

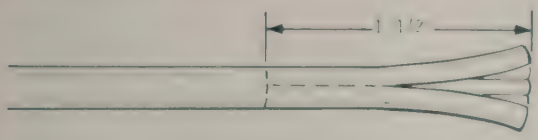
( ) Refer to Detail 1-2B and install the fuseholder at F1. Use the hardware supplied with the fuseholder. Be sure to position the lugs as shown. NOTE: Do not overtighten the hardware or the fuseholder may crack.

( ) Refer to Detail 1-2C and bend lug 1 of the fuseholder out slightly. Be careful that you do not apply pressure to the lug where it comes out of the fuseholer.

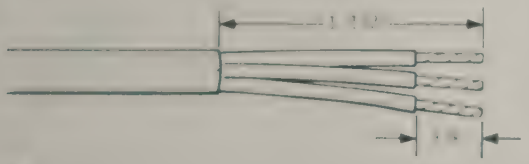



**Detail 1-2C**

( ) Refer to Detail 1-2D and prepare the end of the line cord as shown.




1. REMOVE 1-1/2" OF OUTER INSULATION. BE CAREFUL THAT YOU DO NOT CUT THE INSULATION OF THE INNER LEADS.



2. CUT THE LEADS TO THE INDICATED LENGTHS AND REMOVE 3/8" INSULATION FROM THE END OF EACH LEAD

3. TWIST THE FINE WIRE STRANDS AT THE END OF EACH LEAD AND MELT A VERY SMALL AMOUNT OF SOLDER TO THE STRANDS TO HOLD THEM TOGETHER.

**Detail 1-2D**

( ) Insert the prepared end of the line cord through hole BC from the outside of the AC chassis. Then refer to Detail 1-2E and install the line cord strain relief on the line cord.

( ) Refer to inset drawing #2 on Pictorial 1-2 and mount the strain relief to the inside of the chassis with a #6 × 5/8" black self-tapping screw. Position the shoulder of the strain relief into the hole in the chassis.

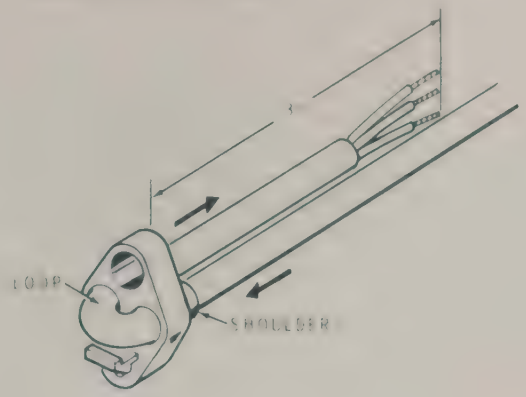
( ) Refer to Detail 1-2F and install the rocker switch in the AC chassis at SW3 from the outside. Make sure the lugs are positioned as shown.

( ) Connect the black line cord lead to fuseholder F1 lug 2. Make this connection mechanically secure and then solder the connection.

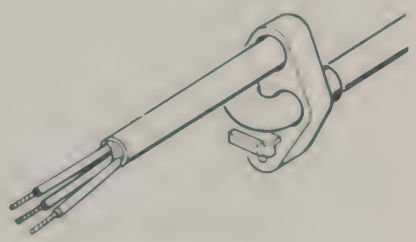
( ) Connect the green line cord lead to solder lug BB. Make this connection mechanically secure and then solder the connection.

( ) Connect the white line cord lead to switch SW1 lug 6. Make this connection mechanically secure but <u>do not</u> solder the connection.

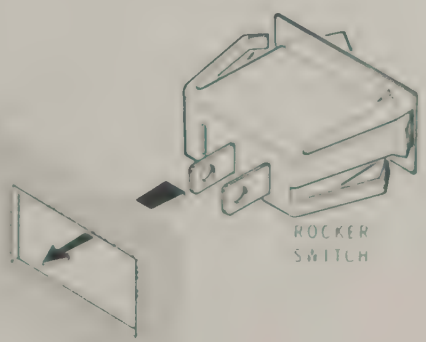
1. INSERT THE PREPARED END OF THE CABLE THROUGH THE SHOULDER ON THE STRAIN RELIEF AND BACK THROUGH THE SIDE HOLE.




2. ROUTE THE PREPARED END OF THE CABLE BACK THROUGH THE UPPER HOLE IN THE STRAIN RELIEF AND PULL IT TIGHT



**Detail 1-2E**




**Detail 1-2F**

( ) Prepare the following black solid wires:

1-1/2"
1-1/2"
3"
2"

NOTE: In the following steps, (NS) means not to solder the connection because other wires or leads will be added later. (S-) with a number such as (S-3) means to solder the connection. The number following the "S" tells how many wires are in the connection.

Make the connections in the next four steps mechanically secure.

( ) Connect a 1-1/2" black wire between SW2 lug 2 (S-1) and SW1 lug 2 (S-1).

( ) Connect a 1-1/2" black wire between SW2 lug 5 (S-1) and SW1 lug 5 (NS).

( ) Connect a 3" black wire between SW1 lug 3 (NS) and SW3 lug 3 (S-1).

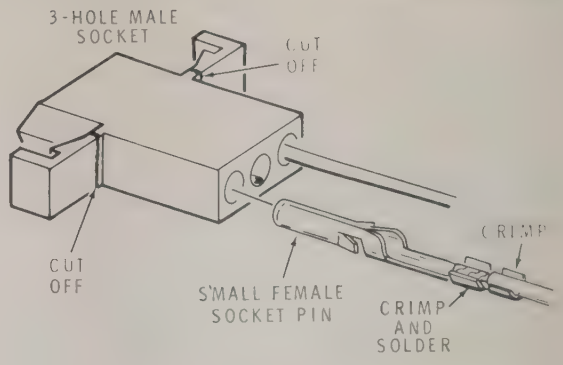
( ) Connect a 2" black wire between SW3 lug 2 (S-1) and fuseholder F1 lug 1 (S-1).

Refer to Pictorial 1-3 (Illustration Booklet, Page 5) for the following steps.

NOTE: There are two sizes of red stranded wire in this kit. (Note that the insulation on one wire is thicker than on the other.) When red stranded wire is called for, use the red wire with the thinner insulation unless otherwise specified as in the next step.

( ) Prepare two 15" red stranded wires (thick insulation). Remove 1/4" of insulation from one end of each wire and 1/8" of insulation from the other.

( ) Locate a 3-hole male socket. Then refer to Detail 1-3A and cut off the ears. Use this socket in the next step.




**Detail 1-3A**

( ) Refer to Detail 1-3A and crimp and solder a small female socket pin onto the 1/8" end of each red wire. Then insert these pins into the two outside holes of a 3-hole male socket.

( ) Insert the other end of these two red wires through the small hole in the back of the AC housing (same as the power transformer leads).

Position the AC chassis under the right rear corner of the base and connect the two red wires and the power transformer leads as follows. Make these connections mechanically secure.

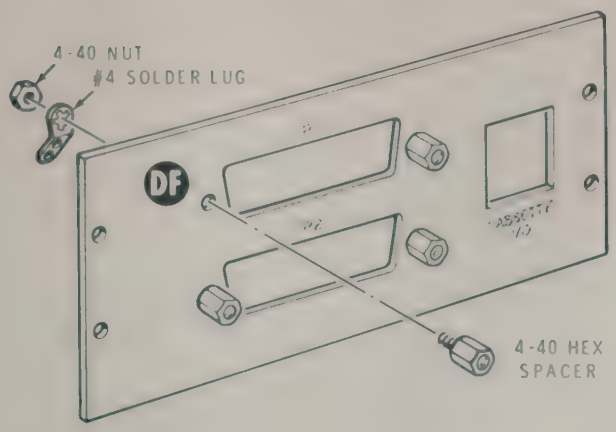
( ) Connect either one of the two 15" red wires to SW1 lug 5 (S-2).

( ) Connect the other 15" red wire to SW1 lug 3 (NS).

( ) Black-gray transformer lead to SW2 lug 1 (S-1). NOTE: Do not use the black-white lead by mistake.

( ) Black-yellow transformer lead to SW2 lug 3 (S-1).

( ) Black-white lead to SW2 lug 4 (S-1).




**Detail 1-4A**

( ) Black-green lead to SW2 lug 6 (S-1).

( ) Black-red lead to SW1 lug 3 (S-3).

( ) Black lead to SW1 lug 6 (S-2).

( ) Connect the green wire to solder lug BA (S-1).

Refer to Pictorial 1-4 (Illustration Booklet, Page 5) for the following steps.

( ) Mount the AC chassis into the AC housing with three 6-32 × 3/8" screws. Be careful that you do not pinch any wires between the AC chassis and the housing.

NOTE: If the hex spacers that will be mounted next have extra hardware with them, this can be discarded.

( ) Refer to Detail 1-4A and install a 4-40 hex spacer a #4 solder lug and a 4-40 nut at DF on the connector plate. Do not use a 6-32 hex spacer by mistake. Be sure to position the solder lug down as shown.

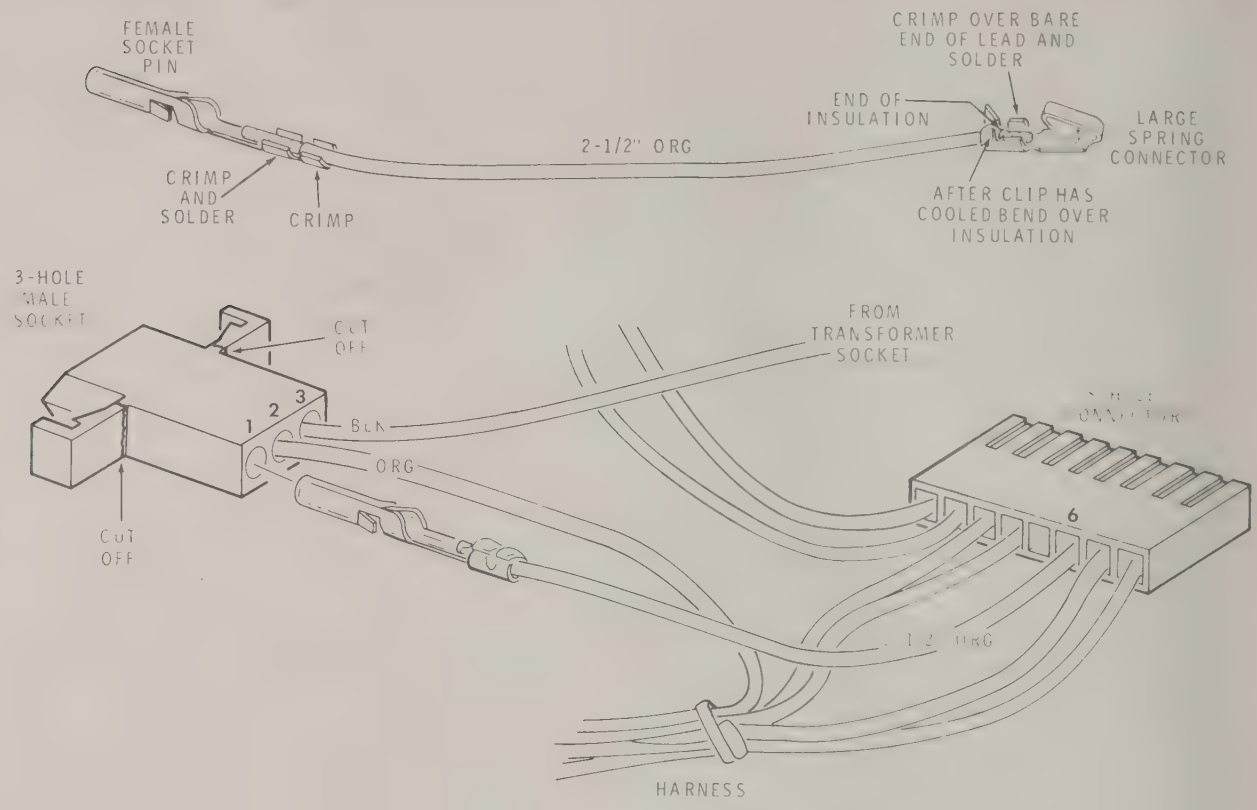
( ) Install 4-40 hex spacers at the other three locations on the connector plate with #4 lockwashers and 4-40 nuts.

( ) Route the 13 " green wire coming from the solder lug on the power transformer through the opening in the rear of the terminal base. Then solder it to solder lug DF on the connector plate.

( ) Mount the connector plate to the rear of the terminal base with four #6 × 1/4" black sheet metal screws. Position the plate so the printing is right side up.

( ) Install a small cable tie around the wires and leads approximately 1" from where they go through the small hole in the AC housing.

( ) Install a small cable tie around the transformer leads and two red wires approximately 2" from the fan plug. Do not include the black stranded wire (female connector pin on one end) in this tie.




**Detail 1-5A**

Refer to Pictorial 1-5 (Illustration Booklet, Page 6) for the following steps.

Refer to Detail 1-5A for the following steps.

( ) Locate the harness. Then locate the 8-hole connector on the harness. Refer back to Detail 1-1F on Page 14 and remove the orange wire from this connector.

( ) Cut the spring connector off the end of this orange wire. Then remove 1/8" of insulation from the wire end and apply a small amount of solder to the bare strands.

( ) Crimp and solder a small female socket pin onto the end of the orange harness wire.

( ) Prepare a 2-1/2" orange stranded wire. Remove 1/8" of insulation from each end. Then crimp and solder a female socket pin onto one end of this wire.

( ) Crimp and solder a large spring connector onto the other end of this wire.

( ) Locate a 3-hole male socket and cut off the ears. Use this socket in next step.

( ) Insert the female socket pin on the 2-1/2" orange wire into hole #1 of a 3-hole male socket.

( ) Insert the pin on the orange harness wire into hole 2 of this socket.

( ) Locate the black wire coming from the transformer lead socket. Insert this pin into hole 3 of the 3-hole male socket.

( ) Insert the spring connector on the 2-1/2" orange wire into hole 6 of the 8-hole harness connector (same hole the orange wire was removed from).

( ) Place the harness in the terminal base. The two blue and two black wires (not connected to a socket) will be connected to capacitor C1 in the following steps.

NOTE: Since capacitor C1 may be one of two different styles, refer to Pictorial 1-5 or to inset drawing #1 in the next two steps for the style you received.

( ) Connect both black wires to the negative lug of capacitor C1 (S-2).

( ) Connect both blue wires to the positive lug of capacitor C1 (S-2).

( ) Refer to inset drawing #2 on Pictorial 1-5 and push the insulator cap down over capacitor C1.

Set the remaining parts aside temporarily; you will use them later. If you need hardware, parts or wire to complete a circuit board assembly, remove the needed parts from the main pack.

Proceed to "Power Supply Circuit Board."

# POWER SUPPLY CIRCUIT BOARD (Pack #1)

## PARTS LIST

Locate Pack #1 and check each part against the following list and the Parts Pictorial (Illustration Booklet, Page 7). Any part that is packed in an individual envelope with the part number on it should not be removed from its envelope until it is called for in a step. Do not discard any packing materials until all parts are accounted for.

To order a replacement part, always include the Part Number and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| **ELECTROLYTIC CAPACITORS** | | | | |
| A1 | 25-197 | 3 | 1 μF tantalum | C105, C106, C107 |
| A2 | 25-891 | 1 | 470 μF | C104 |
| A3 | 25-906 | 1 | 4700 μF | C102 |
| A4 | 25-902 | 2 | 10,000 μF | C101, C103 |
| **DIODES — REGULATOR** | | | | |
| B1 | 57-42 | 4 | 3A1 diode | D101, D102, D103, D104 |
| B1 | 57-65 | 4 | 1N4002 diode | D109, D110, D111, D112 |
| B2 | 57-67 | 1 | 10A20 bridge rectifier | BR101 |
| B3 | 442-30 | 1 | LM309K regulator | U101 |
| **SOCKETS — CONNECTORS — PINS** | | | | |
| C1 | 434-117 | 3 | Transistor socket | |
| C2 | 432-149 | 1 | 3-hole female socket | |
| C3 | 434-319 | 1 | 4-hole male plug | |
| C4 | 432-954 | 1 | Small 4-hole connector shell | |
| C5 | 432-1070 | 1 | Large 4-hole connector shell | |
| C6 | 432-1069 | 1 | 4-pin plug | P103 |
| **Sockets — Connectors — Pins (cont'd.)** | | | | |
| C7 | 432-876 | 2 | 8-pin plug | |
| C8 | 432-1002 | 4 | Large female socket pin | |
| **HARDWARE** | | | | |
| D1 | 250-1264 | 3 | 6-32 × 3/8" hex head screw | |
| D2 | 250-162 | 6 | 6-32 × 1/2" screw | |
| D3 | 252-3 | 3 | 6-32 nut | |
| D4 | 254-1 | 4 | #6 lockwasher | |
| D5 | 259-1 | 4 | #6 solder lug | |
| **MISCELLANEOUS** | | | | |
| E1 | 73-80 | 1 | Foam pad | |
| | 85-2173-2 | 1 | Power supply circuit board | |
| E2 | 204-182 | 1 | Capacitor support bracket | |
| E3 | 354-7 | 1 | Large cable tie | |
| E4 | 354-5 | 7 | Small cable tie | |
| E5 | 215-637 | 1 | Power supply heat sink | |

# ASSEMBLY NOTES

## ASSEMBLY

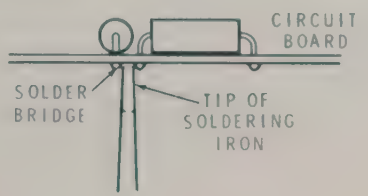
1. Position all parts as shown in the Pictorials.

2. Solder a part or a group of parts only when you are instructed to do so.

## SOLDERING

1. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

2. Do not create solder bridges between adjacent circuit board foils. A solder bridge usually occurs when you use too much solder and then drag the soldering iron across the board when you remove it from the connection. Always use just enough solder to make a good connection, and lift the soldering iron straight up from the circuit board. If a solder bridge should develop, turn the circuit board foil side down and heat the solder between connections. The excess solder will run onto the tip of the soldering iron, and this will remove the solder bridge. See the drawing below. You can also place the desoldering wick (braid) on a solder bridge. Then heat the wick with the soldering iron and the wick will soak up the excess solder. If you suspect a solder bridge exists, but are not sure, compare the foil side of the circuit board with the "X-Ray View" of that circuit board (located in the Operation Manual).



# STEP-BY-STEP ASSEMBLY

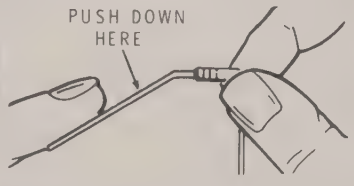
## POWER SUPPLY CIRCUIT BOARD ASSEMBLY

**START**

In the following steps, you will be given detailed instructions on how to install and solder the first part on the circuit board. Read and perform each step carefully. Then use the same procedure whenever you install parts on a circuit board.

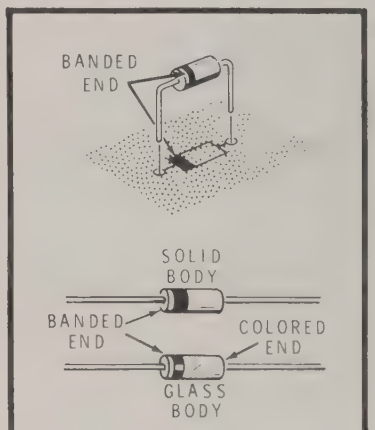
( ) Position the circuit board as shown with the printed side (not the foil side) up.

( ) D101: Hold a 3A1 diode (#57-42) by the body as shown and bend the leads straight down.

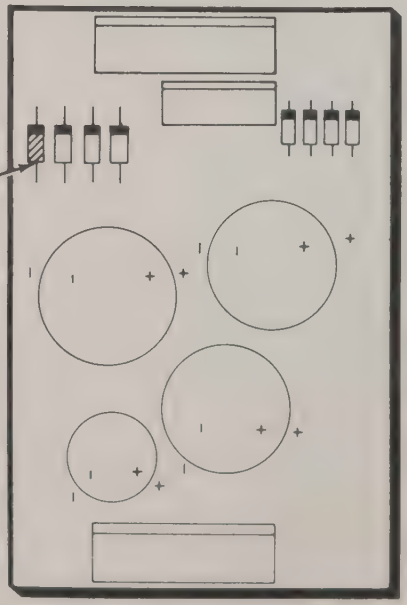



( ) Push the leads through the holes at the indicated location on the circuit board. Match the band mark on the circuit board. See Detail 2-1A. THE CIRCUITRY WILL NOT WORK PROPERLY IF A DIODE IS INSTALLED BACKWARDS.

( ) Press the diode against the circuit board. Then bend the leads outward slightly to hold the diode in place.




**Detail 2-1A**

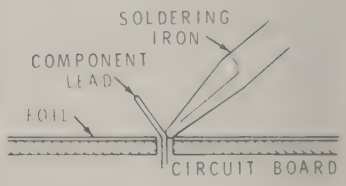


**PICTORIAL 2-1**

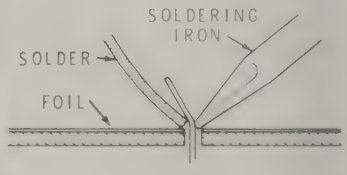
**CONTINUE**

( ) Solder the diode leads to the circuit board as follows:

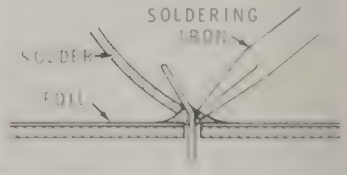
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat **both** for two or three seconds.




2. Then apply solder to the other side of the connection. IMPORTANT: Let the heated lead and the circuit board foil melt the solder.




3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.

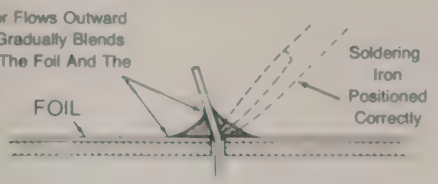



( ) Cut off the excess lead lengths close to the connection. WARNING: Clip the leads so the ends will not fly toward your eyes.

( ) Check each connection. Compare it to the illustrations on Page 27. After you have checked the solder connections, proceed with the assembly on Page 28. Use the same soldering procedure for each connection.

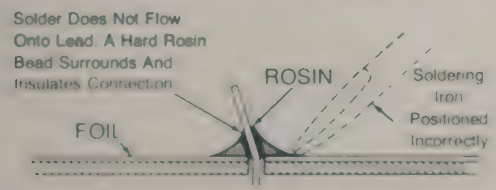
**FINISH**

## A GOOD SOLDER CONNECTION

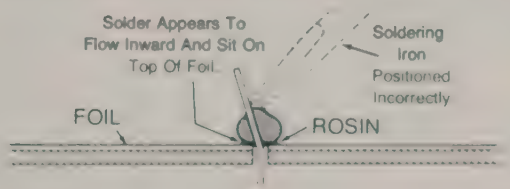



When you heat the lead and the circuit board foil at the same time, the solder will flow evenly onto the lead and the foil. The solder will make a good electrical connection between the lead and the foil.

## POOR SOLDER CONNECTIONS


Solder Does Not Flow Onto Lead. A Hard Rosin Bead Surrounds And Insulates Connection
ROSIN
Soldering Iron Positioned Incorrectly
FOIL

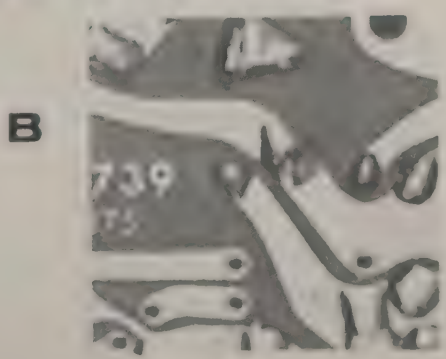
When the lead is not heated sufficiently, the solder will not flow onto the lead as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.




When the foil is not heated sufficiently the solder will blob on the circuit board as shown above. To correct, reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.

## SOLDER BRIDGES

A solder bridge between two adjacent foils is shown in photograph **A**. Photograph **B** shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. A good rule to follow is: always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together. NOTE: It is alright for solder to bridge two connections on the same foil.




Use only enough solder to make a good connection, and lift the soldering iron straight up from the circuit board. If a solder bridge should develop, turn the circuit board foil-side-down and heat the solder between connections. The excess solder will run onto the tip of the soldering iron, and this will remove the solder bridge. NOTE: The foil side of most circuit boards has a coating on it called "solder resist". This is a protective insulation to help prevent solder bridges.

**START**

NOTE: Make sure you have installed the first diode in Pictorial 2-1.

Install 3A1 diodes (#57-42) in the following three locations.

( ) D102 .....
( ) D103 .....
( ) D104 .....

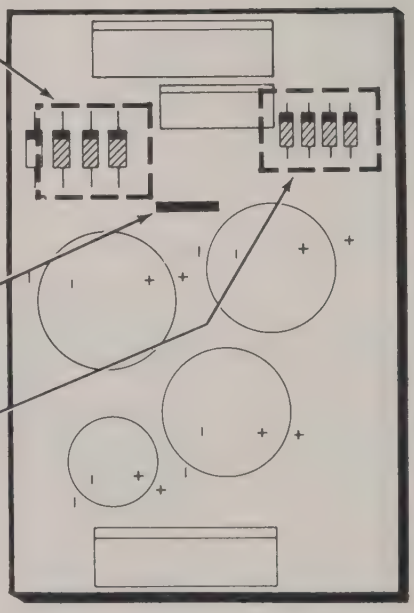
( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) Cut a 3/4" bare wire.

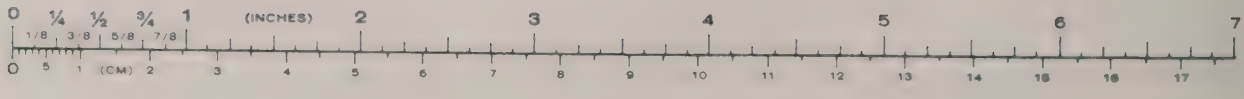
( ) 3/4" bare wire. Solder the wire ends to the foil and cut off the excess.

Install 1N4002 diodes (#57-65) in the following four locations.

( ) D109 .....
( ) D110 .....
( ) D111 .....
( ) D112 .....



PICTORIAL 2-2

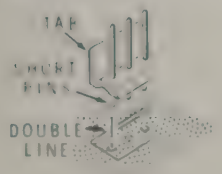


**START**

( ) P101: 8-pin plug.

Install the plug as follows:

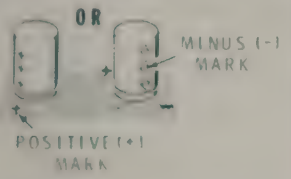
1. Match the tab side of the plug with the double line of the outline on the board.
2. Insert the short pins in the holes and solder them to the foil.



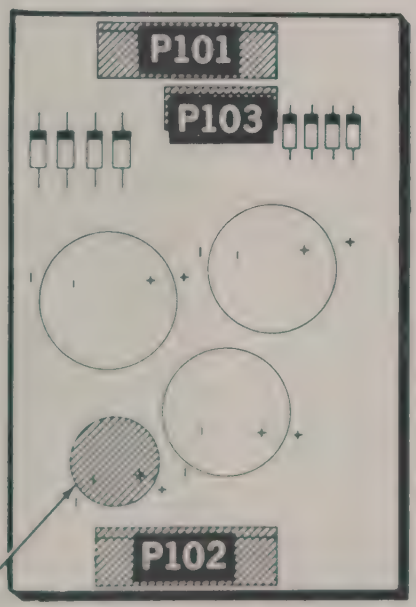

( ) P103: 4-pin plug.

( ) P102: 8-pin plug.

NOTE: When you install electrolytic capacitors, always position the plus (+) or minus (−) marking on the capacitor toward the corresponding mark on the circuit board.




( ) C104: 470 μF electrolytic. Solder the leads to the foil and cut off the excess lead lengths.




**CONTINUE**

**CIRCUIT BOARD CHECKOUT**

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) Poor solder connections.

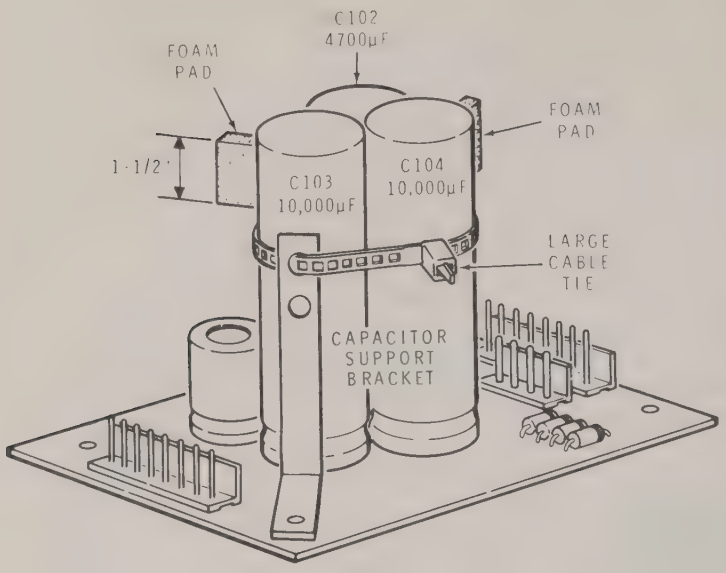
( ) Solder bridges between foils.

( ) Protruding leads which could touch together.

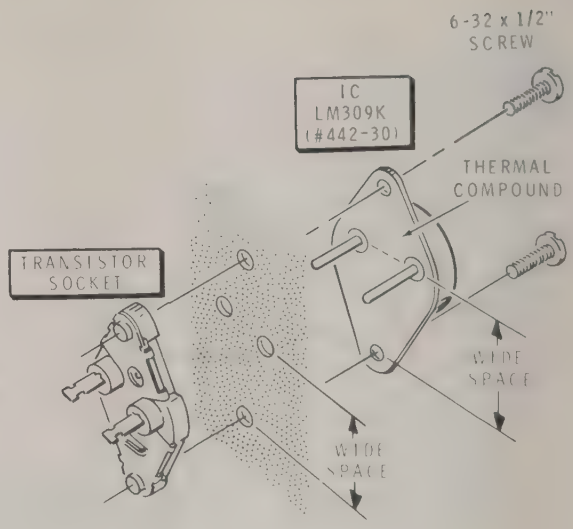
( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) Diodes for the correct position of the banded end.

PICTORIAL 2-3




**Detail 2-3A**




**Detail 2-4A**

Refer to Detail 2-3A and install the following three electrolytic capacitors as shown with a foam pad, a capacitor support bracket and a large cable tie.

1. Locate the 2-1/2" × 5" foam pad and cut a 2-1/2" × 1-1/2" pad. Remove the paper backing from one side of this pad.

2. Insert the capacitor leads through the circuit board holes. Note the plus (+) or minus (−) markings. Do not solder the leads.

3. Position the foam pad down between the capacitors (sticky side toward C104 and C103). Position the top of the pad even with the top of the capacitors.

4. Align the bottom hole in the capacitor support bracket with the hole in the circuit board and install a large cable tie through the top hole in the bracket and around the three capacitors. This cable tie should be just under the foam pad. Pull the cable tie tight.

5. Seat the electrolytics against the circuit board and solder their leads to the foil. Cut off any excess lead lengths. The capacitor support bracket will be secured later.

Refer to Pictorial 2-4 (Illustration Booklet, Page 7) for the following steps.

WARNING: You will be using Dow Corning 340 thermal compound in the following steps. Although this compound is not caustic, it may cause temporary discomfort if it gets into your eyes. If this happens, rinse your eyes with warm water. If the compound gets on your clothing, it may require professional cleaning, so handle the compound carefully. This compound contains zinc oxides, $SiO_2$ and slight traces of $CO_2$.

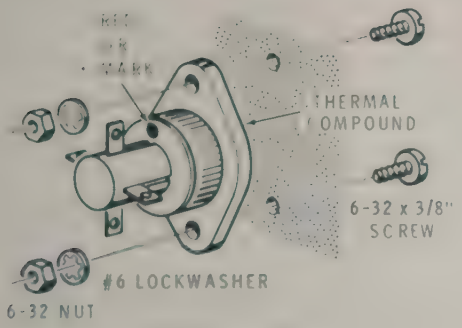
( ) Locate the thermal compound in the main pack and make a small slit in one side of the container.

Refer to Detail 2-4A for the next two steps.

( ) Spread a coating of thermal compound on the LM309K IC (#442-30). Use this IC in the next step.

NOTE: The IC pins are closer to one end of the IC than to the other end. Note this difference in spacing in the next step. The IC will properly mount only one way.

( ) U101: Mount the IC and a transistor socket at U101. Use two 6-32 × 1/2" screws.




**Detail 2-4B**

NOTE: The next two transistor sockets will be installed without IC's. These are for later expansion of your power supply if you choose to add on to your System.

( ) Mount a transistor socket at U102 with two 6-32 × 1/2" screws.

( ) In the same manner, mount a transistor socket at U103.

( ) Locate the 10A20 bridge rectifier (#57-67) and apply thermal compound to its flat side.

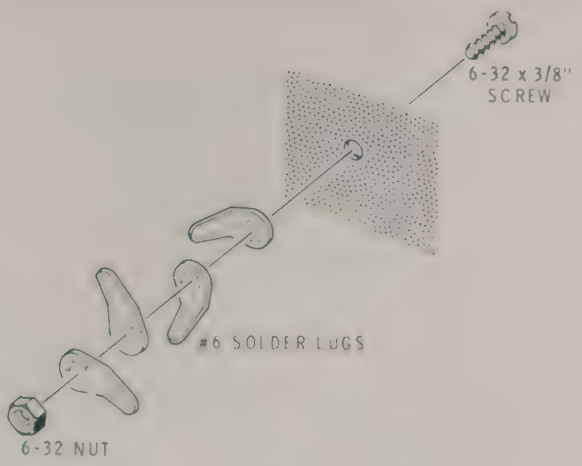
( ) BR101: Refer to Detail 2-4B and mount the bridge rectifier to the heat sink at BR101. Be sure to position it with the red or plus (+) marked lug toward U101 as shown. Use two 6-32 × 3/8" screws, two #6 lockwashers and two 6-32 nuts.

( ) Refer to Detail 2-4C and mount four #6 solder lugs to the heat sink at GA. Use a 6-32 × 3/8" screw and a 6-32 nut.

( ) Locate three 1 μF tantalum capacitors. Cut the leads of each capacitor 1/2" from the body.

NOTE: The tantalum capacitors are marked with either a plus (+) or color mark on one end or a minus (−) mark on the other end. If your capacitors have a minus (−) mark only, consider the other end to be the plus (+) marked end.

( ) C105: Connect the plus (+) marked end of a 1 μF tantalum capacitor to U101 lug 1 (NS) and the other end to lug 3 (NS).




**Detail 2-4C**

( ) C106: In the same manner, connect a 1 μF tantalum capacitor to U102 between lugs 1 (NS) and 3 (NS).

( ) C107: In the same manner, connect a 1 μF tantalum capacitor to U103 between lugs 1 (NS) and 3 (NS).

( ) Prepare the following stranded wires.

| | |
|---|---|
| 1-1/2" black | 2-1/2" black |
| 2" black | 3" red |
| 2-1/2" black | 3" red |

( ) Connect a 1-1/2" black wire between the **LOWER** HOLE (hole nearest the nut) in solder lug GA lug 1 (S-1) and U101 lug 3 (S-2).

( ) Connect a 2" black wire between the lower hole in GA lug 4 (S-1) and U102 lug 3 (S-2).

( ) Connect a 2-1/2" black wire between the lower hole in GA lug 3 (S-1) and U103 lug 3 (S-2).

( ) Connect a 2-1/2" black wire between the lower hole in GA lug 2 (S-1) and BR101 lug 3 (NS).

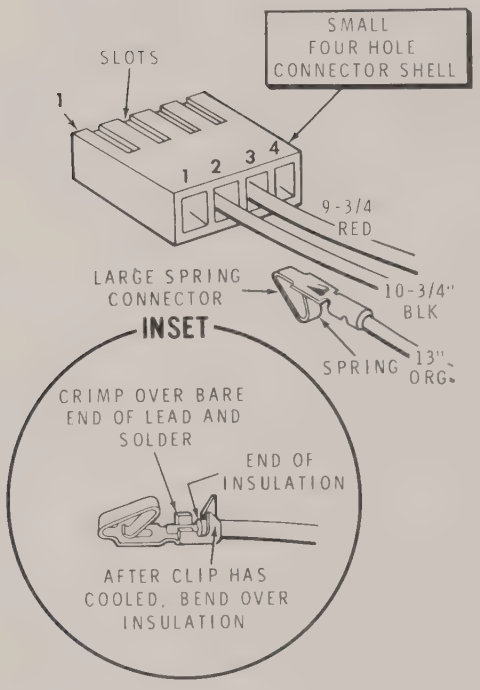
( ) Connect a 3" red wire between U101 lug 1 (NS) and U102 lug 1 (S-2).

( ) Connect a 3" red wire between U101 lug 1 (S-3) and BR101 lug 1 (NS).

Refer to Pictorial 2-5 (Illustration Booklet, Page 8) for the following steps.

( ) Prepare the following stranded wires. Remove 1/4" of insulation from one end of each wire and 1/8" of insulation from the other end.

9-3/4" red
10-3/4" black
13" orange




**Detail 2-5A**

( ) Locate eight (1 extra) large spring connectors in the main pack. Use these in the following steps.

( ) Refer to Detail 2-5A and crimp and solder a large spring connector onto the 1/8" end of each wire.

( ) Locate the small 4-hole connector shell and the large 4-hole connector shell and place them side by side. Use the **small** 4-hole connector shell in the next step.

Again refer to Detail 2-5A and insert the spring connector on each wire into a small 4-hole connector shell as follows:

( ) Orange wire in hole 1.

( ) Black wire in hole 2.

( ) Red wire in hole 3.

( ) No wire in hole 4.

( ) Gently pull on the wires to make sure the spring connectors are securely locked in the connector shell.

Connect the other end of these wires as follows:

( ) Red wire to U101 lug 2 (S-1).

( ) Black wire to the upper hole in GA lug 2 (S-1).

( ) Orange wire to U103 lug 1 (NS).

( ) Install a small cable tie around the three wires approximately 2" from the connector.

( ) In the same manner, install a second small cable tie approximately 4" from the first tie and a third small cable tie near U101.

( ) Prepare the following stranded wires. Remove 1/4" of insulation from one end of each wire and 1/8" of insulation from the other end.

3" orange
3" black
3-1/2" orange
3" red

( ) Crimp and solder a large spring connector onto the 1/8" end of each wire.

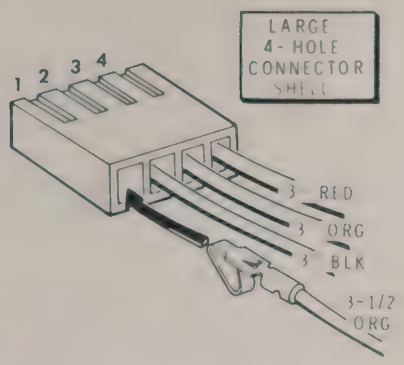
Refer to Detail 2-5B and insert the spring connector on each wire into a large 4-hole connector shell as follows:

( ) Longer orange wire into hole 1.
( ) Black wire into hole 2.
( ) Orange wire into hole 3.
( ) Red wire into hole 4.

( ) Gently pull on the wires to make sure the spring connectors are securely locked in the connector shell.

Connect the other end of these wires as follows:

( ) First orange wire (from hole 1) to BR101 lug 2 (S-1).
( ) Black wire to BR101 lug 3 (S-2).
( ) Second orange wire to BR101 lug 4 (S-1).
( ) Red wire to BR101 lug 1 (S-2).

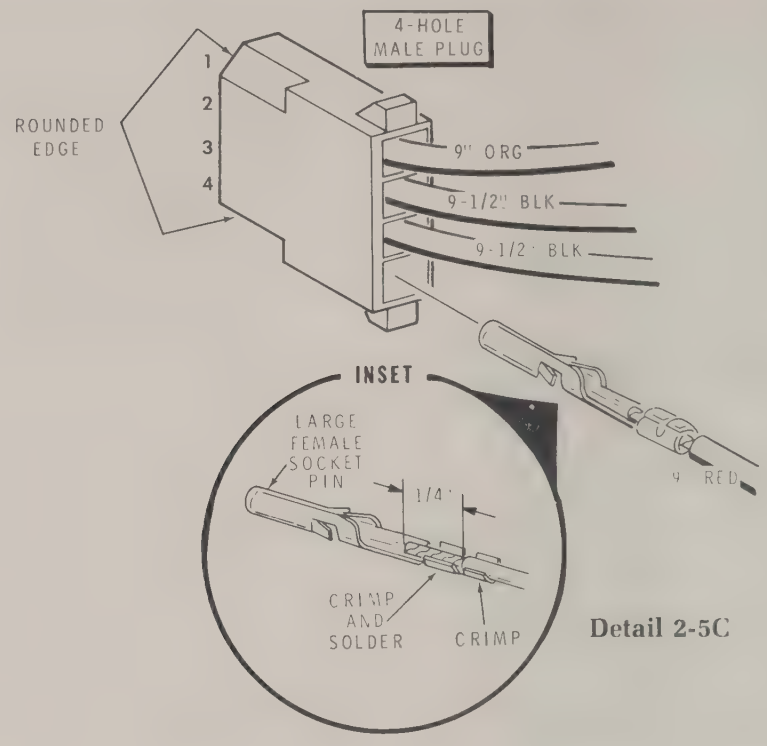



**Detail 2-5B**

( ) Install a small cable tie around the wires coming from BR101. Position this cable tie approximately midway between the connector and BR101.

( ) Prepare the following stranded wires. Remove 1/8" of insulation from one end of each wire and 1/4" of insulation from the other end.

9" orange
9-1/2" black
9-1/2" black
10" red.




**Detail 2-5C**

( ) Refer to Detail 2-5C and crimp and solder a large female socket pin onto the 1/8" bare end of each wire.

Again refer to Detail 2-5C and insert the socket pins on the wires into the 4-hole male plug as follows:

( ) Orange wire in hole 1.
( ) Black wire in hole 2.
( ) Black wire in hole 3.
( ) Red wire in hole 4.

( ) Gently pull on the wires to make sure the socket pins are securely locked into the plug.

Connect the other end of these wires as follows:

( ) Orange wire to U103 lug 2 (S-1).

( ) Either black wire to the upper hole in GA lug 1 (NS).

( ) Other black wire to the upper hole in GA lug 4 (S-1).

( ) Red wire to U102 lug 2 (S-1).

( ) Install a small cable tie around these wires approximately 1-1/2" from the socket.

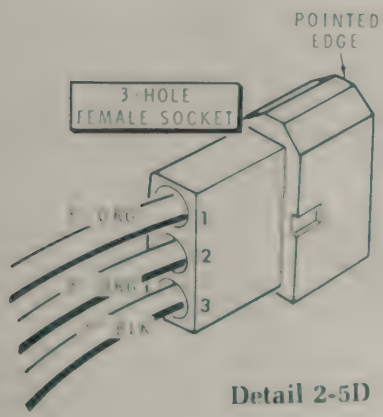
( ) Install a second small cable tie around the wires approximately 3" from the first tie.

( ) Prepare the following stranded wires. Remove 1/8" of insulation from one end of each wire and 1/4" of insulation from the other end.

3" orange
3" orange
5" black

( ) Locate three small male socket pins in the main pack. Use these in the next step.

( ) Crimp and solder a small male socket pin on the 1/8" end of each wire.




**Detail 2-5D**

Refer to Detail 2-5D and insert the socket pins on the wires into the 3-hole female socket as follows:

( ) Orange wire in hole 1.
( ) Orange wire in hole 2.
( ) Black wire in hole 3.

( ) Gently pull on the wires to make sure the socket pins are securely locked in the socket shell.

Connect the other end of these wires as follows:

( ) Both orange wires to U103 lug 1 (S-4).
( ) Black wire to the upper hole in GA lug 1 (S-2).

( ) Install a small cable tie around the wires near U103.

NOTE: If your supply voltage (line voltage) is 120 VAC, install the 1-1/2 ampere fuse in the next step. If your supply voltage is 240 VAC, install the 1-ampere fuse.

( ) Remove the fuseholder cap and install the appropriate fuse. Then reinstall the cap. Do not overtighten the cap.

This completes this portion of the assembly and wiring of the power supply heat sink. Proceed to "Installation and Checkout."

# INSTALLATION AND CHECKOUT

NOTE: The following test will require a high input impedance type volt/ohmmeter. If you do not have a meter, we suggest that you borrow one, as these measurements are very important to insure that your unit will not be damaged when power is applied.

Perform each of the following measurements. If you do not obtain the correct meter reading, refer to the "Possible Area of Trouble" chart that follows the section. Correct any problem that you may encounter before you continue.

## POWER OFF TEST

Refer to Pictorial 3-1 (Illustration Booklet, Page 9) for the following steps.

( ) Set your ohmmeter range switch to the X1 position.

( ) Connect your negative ohmmeter lead to one of the solder lugs on the power transformer.

( ) Set the POWER switch to OFF (ON side of switch out).

( ) Touch the positive ohmmeter lead to first one and then the other flat prong on the line cord plug. The meter should read INFINITE.

( ) Touch the positive ohmmeter lead to the round prong on the line cord plug. The meter should read "0" resistance.

( ) Connect the negative ohmmeter lead to one flat prong and the positive ohmmeter lead to the other flat prong of the line cord plug. The meter should read INFINITE.

( ) With the ohmmeter leads still connected as in the previous step, set the POWER switch to ON. The ohmmeter should read approximately two ohms.

( ) Disconnect the ohmmeter leads and place the POWER switch in the OFF position.

| POSSIBLE AREA OF TROUBLE |
|---|
| 1. Fuseholder (fuse not installed). |
| 2. Faulty wiring between switches and fuseholder. |
| 3. Ohmmeter is connected to the round prong in place of the flat prong on the line cord plug. |

Refer to Pictorial 3-2 (Illustration Booklet, Page 10) for the following steps.

NOTE: Use hardware from the main pack in the following steps.

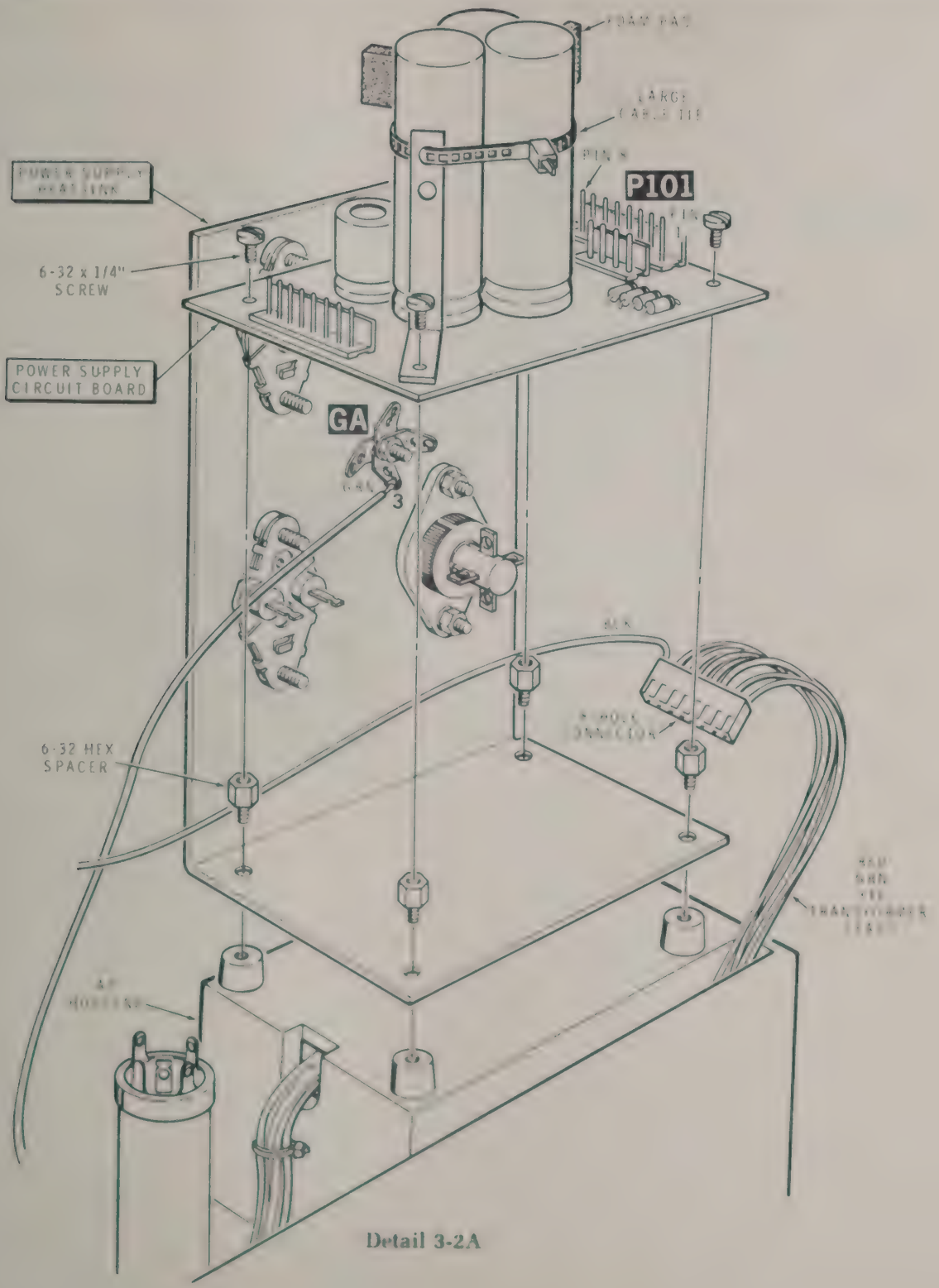
( ) Refer to Detail 3-2A and mount the power supply heat sink to the top of the AC housing with four 6-32 hex spacers.

( ) Locate the free end of the 12" green wire coming from the solder lug on the power transformer. Connect this to the outer hole in GA lug 3 (S-1) on the power supply heat sink.

( ) Refer to Detail 3-2A and position the red, green, and yellow transformer leads along the edge of the base as shown. Position the black wire coming from the 8-hole connector along the power supply heat sink.

( ) Again refer to Detail 3-2A and mount the power supply circuit board to the top of the hex spacers with four 6-32 × 1/4" screws. Make sure the circuit board is positioned with plug P101 toward the rear of this unit.

( ) Set your ohmmeter range switch to the ×1000 position.


P101
6-32 x 1/4" SCREW
POWER SUPPLY CIRCUIT BOARD
GA
6-32 HEX SPACER

Detail 3-2A

NOTE: The internal wiring of most ohmmeters is such that the positive terminal of the meter battery is connected to the positive test lead and the negative battery terminal is connected to the negative test lead. In some ohmmeters, this wiring is reversed, and this could give you the wrong readings. Therefore, if you do not obtain the correct results in the following tests, reverse your ohmmeter leads and measure again. If the readings are now correct, change the first line of the chart below as follows:

Change the word "negative" to "positive"
Change the word "positive" to "negative"

Make the following ohmmeter readings on plug P101 on the power supply circuit board. Permit the meter needle time to stop moving before you read it.

| | NEGATIVE OHMMETER LEAD | POSITIVE OHMMETER LEAD | OHMMETER READING |
|---|---|---|---|
| ( ) | P101, pin 1 | P101, pin 2 | INFINITE |
| ( ) | P101, pin 4 | P101, pin 5 | Greater than 10 kΩ. |
| ( ) | P101, pin 8 | P101, pin 6 | Greater than 10 kΩ. |
| ( ) | P101, pin 8 | P101, pin 7 | Greater than 10 kΩ. |
| ( ) | P101, pin 8 | P101, pins 1, 2, 4, and 5 (one at a time). | INFINITE at each pin. |

( ) Refer to the inset drawing on Pictorial 3-2 and insert a large polarizing plug into socket S101, hole 3.

( ) In the same manner, insert another large polarizing plug into socket S102, hole 5.

( ) Cut pin 3 off circuit board plug P101. Make sure you remove the correct pin and cut it off close to the plug body.

( ) In the same manner, cut off pin 5 of plug P102.

Refer to Pictorial 3-3 (Illustration Booklet, Page 10) for the following steps.

NOTE: Whenever you install a connector on a circuit board plug as in the next step, always position the slotted side of the connector away from the raised part of the plug (the slots should be easily visible after the connector is installed). Also, make sure you do not install the connector one pin off. For example: you can install the connector with plug pin 2 in hole 1 of the connector.

( ) Connect the 4-hole connector coming from BR101 (S103) to plug P103 on the power supply circuit board.

( ) Connect the 8-hole connector on the power transformer leads to plug P101 on the power supply circuit board.

WARNING: When the line cord is connected to an AC outlet, dangerous AC voltage is present inside the AC housing. Do not operate the unit with the AC chassis removed from the AC housing. To do so could result in a hazardous electrical shock.

( ) Connect the 8-hole harness connector to plug P102 on the power supply circuit board.

( ) Connect the 3-hole male plug on the harness to the 3-hole female socket coming from the power supply heat sink.

( ) Set the POWER switch to ON.

( ) Set your voltmeter to read approximately 150 volts DC. Reduce this range setting if a measurement requires a lower range.

NOTE: In the following steps, touch your meter probe to the spring connector through the slot in the side of the shell.

Make the following tests on the pins of P102 on the power supply circuit board and check for the indicated meter reading.

| | NEGATIVE LEAD TO: | POSITIVE LEAD TO: | APPROXIMATE METER READING: |
|---|---|---|---|
| ( ) | P102, pin 2 | P102, pin 1 | 70 VDC |
| ( ) | P102, pin 4 | P102, pin 3 | 13 VDC |
| ( ) | P102, pin 7 | P102, pin 6 | +20 VDC |
| ( ) | P102, pin 7 | P102, pin 8 | −20 VDC |
| ( ) | Heat sink | S516 pin 3 | 5 VDC |
| ( ) | Heat sink | S516 pin 1 | 18 VDC |

| POSSIBLE AREA OF TROUBLE | |
|---|---|
| 1 | Diodes D101 thru D112 installed backward or faulty. |
| 2 | Solder bridge on the foil side of the circuit board. |
| 3 | Fuse open. Check for a short somewhere else in the circuit. |
| 4 | Electrolytic capacitor C1, C101, C102, or C104. |

( ) Set the POWER switch to OFF and disconnect the line cord.

( ) Secure the harness (coming from plug P102) to the top of capacitor C1 with a large cable tie from the main pack.

This completes the power supply checkout. Proceed to "Video Circuit Board."

# VIDEO CIRCUIT BOARD (Pack #2)

## PARTS LIST

Locate Pack #2 and check each part against the following list and the Video Circuit Board Parts Pictorial (Illustration Booklet, Page 11). Any part that is packed in an individual envelope with the part number on it should not be removed from its envelope until it is called for in a step. Do not discard any packing materials until all parts are accounted for.

To order a replacement part, always include the Part Number and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover. Your Warranty is inside the front cover. For prices, refer to the separate "Heath Parts Price List."

### RESISTORS

NOTE: These resistors may be packed in more than one envelope. Open all the resistor envelopes in this pack before you check them against the Parts List. All resistors are 5%, 1/2-watt unless otherwise specified. 5% resistors have a gold fourth color band. 10% resistors have a silver fourth color band.

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| A1 | 6-279 | 2 | 2.7 Ω (red-viol-gld) | R246, R247 |
| A1 | 6-479 | 1 | 4.7 Ω (yel-viol-gld) | R248 |
| A1 | 6-150 | 1 | 15 Ω (brn-grn-blk) | R244 |
| A1 | 6-220 | 1 | 22 Ω (red-red-blk) | R219 |
| A1 | 6-330 | 1 | 33 Ω (org-org-blk) | R218 |
| A1 | 6-470 | 2 | 47 Ω (yel-viol-blk) | R213, R258 |
| A1 | 6-750 | 1 | 75 Ω (viol-grn-blk) | R217 |
| A1 | 6-101 | 3 | 100 Ω (brn-blk-brn) | R206, R237, R262 |
| A1 | 6-201 | 1 | 200 Ω (red-blk-brn) | R257 |
| A1 | 6-331 | 1 | 330 Ω (org-org-brn) | R266 |
| A1 | 6-471 | 2 | 470 Ω (yel-viol-brn) | R221, R245 |
| A1 | 6-102 | 5 | 1000 Ω (brn-blk-red) | R203, R209, R214, R249, R273 |
| A1 | 6-122 | 1 | 1200 Ω (brn-red-red) | R236 |
| A1 | 6-152 | 1 | 1500 Ω (brn-grn-red) | R222 |

### Resistors (Cont'd.)

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| A1 | 6-182 | 1 | 1800 Ω (brn-gry-red) | R241 |
| A1 | 6-222 | 1 | 2200 Ω (red-red-red) | R243 |
| A1 | 6-332 | 1 | 3300 Ω (org-org-red) | R223 |
| A1 | 6-392 | 2 | 3900 Ω (org-wht-red) | R256, R259 |
| A1 | 6-472 | 3 | 4700 Ω (yel-viol-red) | R202, R205, R274 |
| A1 | 6-6491 | 1 | 6490 Ω, 1% (blu-yel-wht-brn-brn) | R207 |
| A1 | 6-682 | 1 | 6800 Ω (blu-gry-red) | R204 |
| A1 | 6-822 | 2 | 8200 Ω (gry-red-red) | R231, R254 |
| A1 | 6-103 | 3 | 10 kΩ (brn-blk-org) | R232, R235, R239 |
| A1 | 6-223 | 3 | 22 kΩ (red-red-org) | R225, R242, R251 |
| A1 | 6-273 | 3 | 27 kΩ (red-viol-org) | R229, R252, R255 |
| A1 | 6-473 | 2 | 47 kΩ (yel-viol-org) | R234, R267 |
| A1 | 6-623 | 1 | 62 kΩ (blu-red-org) | R233 |
| A1 | 6-823 | 1 | 82 kΩ (gry-red-org) | R269 |
| A1 | 6-104 | 2 | 100 kΩ (brn-blk-yel) | R224, R265 |
| A1 | 6-224 | 1 | 220 kΩ (red-red-yel) | R227 |
| A1 | 6-394 | 1 | 390 kΩ (org-wht-yel) | R272 |
| A1 | 6-105 | 2 | 1 MΩ (brn-blk-grn) | R201, R238 |
| A1 | 6-335 | 2 | 3.3 MΩ (org-org-grn) | R275, R276 |

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| **Resistors (Cont'd.)** | | | | |
| A2 | 6-1871-12 | 1 | 1870 Ω, 1/4-watt, 1% (brn-gry-viol-brn-brn) | R208 |
| A3 | 3-6-2 | 1 | .51 Ω, 2-watt (grn-brn-silv-gld) | R211 |
| A3 | 3-22-2 | 3 | 1.2 Ω, 2-watt, 10% (brn-red-gld-silv) | R261, R263 R264 |
| A4 | 1-50-2 | 1 | 820 Ω, 2-watt (gry-red-brn) | R215 |
| A5 | 3-57-5 | 1 | 1500 Ω, 5-watt, wire wound | R212 |
| **CAPACITORS** | | | | |
| **Mica** | | | | |
| B1 | 20-106 | 1 | 390 pF | C207 |
| **Ceramic** | | | | |
| B2 | 21-121 | 1 | 56 pF | C216 |
| B2 | 21-75 | 2 | 100 pF | C218, C222 |
| B2 | 21-140 | 1 | .001 μF | C201 |
| B2 | 21-176 | 5 | .01 μF | C203, C206, C208, C219, C223 |
| B2 | 21-122 | 3 | .02 μF | C236, C237, C238 |
| B3 | 21-193 | 1 | .005 μ spark gap | C234 |
| **Tantalum** | | | | |
| B4 | 25-220 | 3 | 10 μF (10 m) | C204, C205, C227 |
| B4 | 25-841 | 1 | 4.7 μF (4.7 m) | C213 |
| **Electrolytic** | | | | |
| B5 | 25-299 | 1 | 1.5 μF | C231 |
| B5 | 25-865 | 2 | 10 μF | C202, C215 |
| B6 | 25-911 | 1 | 22 μF, 25V | C239 |
| B6 | 25-882 | 3 | 22 μF, 100V | C226, C228, C235 |
| B6 | 25-883 | 1 | 47 μF | C209 |
| B7 | 25-890 | 1 | 330 μF | C217 |
| **Mylar®** | | | | |
| B8 | 27-73 | 1 | .047 μF | C225 |
| B8 | 27-145 | 2 | .22 μF | C211, C212 |

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| **Polycarbonate** | | | | |
| B9 | 27-206 | 1 | 1 μF | C233 |
| **Polypropylene** | | | | |
| B9 | 29-56 | 1 | .006 μF | C229 |
| B9 | 29-57 | 1 | .22 μF | C232 |
| **POLYSTYRENE** | | | | |
| B10 | 29-22 | 2 | 4700 pF | C221, C224 |
| B10 | 29-32 | 1 | 6800 pF | C214 |
| **DIODES — TRANSISTORS — INTEGRATED CIRCUITS (IC's)** | | | | |
| C1 | 56-56 | 4 | 1N4149 diode | D201, D204, D207, D213 |
| C1 | 56-58 | 1 | 6.2 V zener diode | D205 |
| C1 | 56-73 | 1 | MZ2360 diode | D202 |
| C1 | 56-93 | 1 | FD333 diode | D206 |
| C1 | 56-94 | 1 | 12.8 V zener diode | D203 |
| C1 | 57-27 | 2 | 1N2071 diode | D209, D212 |
| C1 | 57-64 | 1 | DRS110 diode | D211 |
| C1 | 57-614 | 1 | MR508 diode | D208 |

NOTE: Transistors (and integrated circuits) are marked for identification in one of the following four ways:

1. Part Number.
2. Type number.
3. Part number and type number.
4. Part number with a type number other than the one shown.

| | | | | |
|---|---|---|---|---|
| C2 | 417-811 | 1 | MPSL01 transistor | Q209 |
| C2 | 417-821 | 1 | MPSA06 transistor | Q204 |
| C2 | 417-822 | 1 | MPSA56 transistor | Q203 |
| C2 | 417-823 | 1 | MPU131 transistor | Q201 |
| C2 | 417-874 | 1 | 2N3906 transistor | Q212 |
| C2 | 417-875 | 1 | 2N3904 transistor | Q215 |
| C2 | 417-885 | 1 | MPSA65 transistor | Q202 |
| C2 | 417-927 | 1 | MPSA93 transistor | Q218 |
| C3 | 417-195 | 1 | MJE340 transistor | Q216 |
| C3 | 417-924 | 2 | MJE172 transistor | Q208, Q211 |
| C3 | 417-932 | 1 | MJE182 transistor | Q207 |
| C4 | 417-834 | 1 | MPSU10 transistor | Q214 |
| C4 | 417-926 | 2 | MPSU06 or NSDU06 or RCP701C transistor | Q205, Q206 |
| C5 | 417-282 | 1 | MJ2841 transistor | Q213 |
| C5 | 417-923 | 1 | BU500 transistor | Q217 |
| C6 | 442-53 | 2 | NE555 integrated circuit | U201, U202 |

*DuPont Registered Trademark

## INDUCTORS — CHOKES — TRANSFORMERS

| KEY No. | HEATH Part No. | QTY. | DESCRIPTION | CIRCUIT Comp. No. |
|---|---|---|---|---|
| D1 | 40-1947 | 1 | 19 μH inductor | L204 |
| D2 | 40-1948 | 1 | 52 μH inductor | L205 |
| D3 | 40-581 | 1 | 620 μH inductor (blu-red-brn) | L202 |
| D4 | 45-39 | 1 | 4.7 μH choke | L201 |
| D5 | 45-42 | 1 | 8.75 μH choke | L203 |

## CONTROLS

| | | | | |
|---|---|---|---|---|
| E1 | 10-918 | 1 | 500 Ω | R216 |
| E1 | 10-311 | 1 | 5000 Ω | R253 |
| E1 | 10-390 | 2 | 20 kΩ | R226, R228 |
| E1 | 10-941 | 1 | 100 kΩ | R268 |
| E1 | 10-1049 | 1 | 2 MΩ | R271 |

## HARDWARE

NOTES:

1. The hardware may be in more than one packet. Open all the hardware packets, according to their size, before you check the hardware.

2. Hardware is shown actual size. To identify a piece of hardware, place it over the illustration.

| | | | |
|---|---|---|---|
| F1 | 250-34 | 8 | 4-40 × 1/2″ screw |
| F2 | 250-323 | 4 | 4-40 × 5/8″ screw |
| F3 | 250-587 | 2 | 6-32 × 5/16″ screw |

### Hardware (Cont'd)

| | | | |
|---|---|---|---|
| F4 | 252-2 | 12 | 4-40 nut |
| F5 | 252-3 | 2 | 6-32 nut |
| F6 | 253-703 | 4 | Black shoulder washer |
| F7 | 253-80 | 4 | #4 flat washer |
| F8 | 254-9 | 14 | #4 lockwasher |
| F9 | 254-1 | 2 | #6 lockwasher |

## INSULATORS

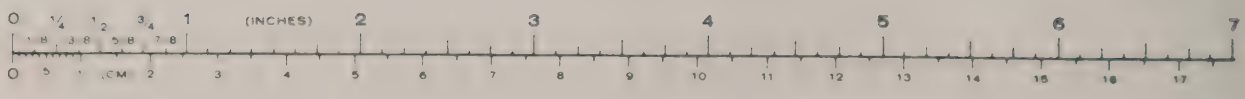
| | | | |
|---|---|---|---|
| G1 | 75-140 | 2 | Large transistor insulator |
| G2 | 75-204 | 3 | Small transistor insulator |
| G3 | 75-142 | 2 | Transistor cover |

## CONNECTORS — SOCKETS

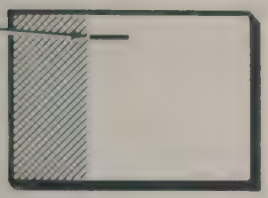
| | | | |
|---|---|---|---|
| H1 | 432-753 | 8 | Large spring connector (one extra) |
| H2 | 432-66 | 1 | Push-on connector |
| H3 | 432-827 | 2 | 4-pin plug |
| H4 | 432-825 | 1 | 6-pin plug |
| H5 | 432-876 | 1 | 8-pin plug |
| H6 | 432-1022 | 1 | 8-hole connector shell |
| H7 | 434-230 | 2 | 8-pin IC socket |
| H8 | 434-326 | 1 | CRT socket with leads |

## MISCELLANEOUS

| | | | |
|---|---|---|---|
| | 85-2165-1 | 1 | Video circuit board |
| | 390-147 | 1 | DANGER label |
| | 344-15 | 8″ | Black stranded wire |
| J1 | 354-5 | 2 | Small cable tie |



# STEP-BY-STEP ASSEMBLY




## START

( ) Position the video circuit board printed side up as shown. Due to its large size, only part of the circuit board will be shown in each Pictorial. Refer to the shaded area in the identification drawing at the top of each page to see what area you are working in.

( ) R223: 3300 Ω (org-org-red).

( ) R224: 100 kΩ (brn-blk-yel).

( ) R227: 220 kΩ (red-red-yel).

( ) R229: 27 kΩ (red-viol-org).

( ) R234: 47 kΩ (yel-viol-org).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R235: 10 kΩ (brn-blk-org).

( ) R241: 1800 Ω (brn-gry-red).

( ) R238: 1 MΩ (brn-blk-grn).

( ) R244: 2200 Ω (red-red-red).

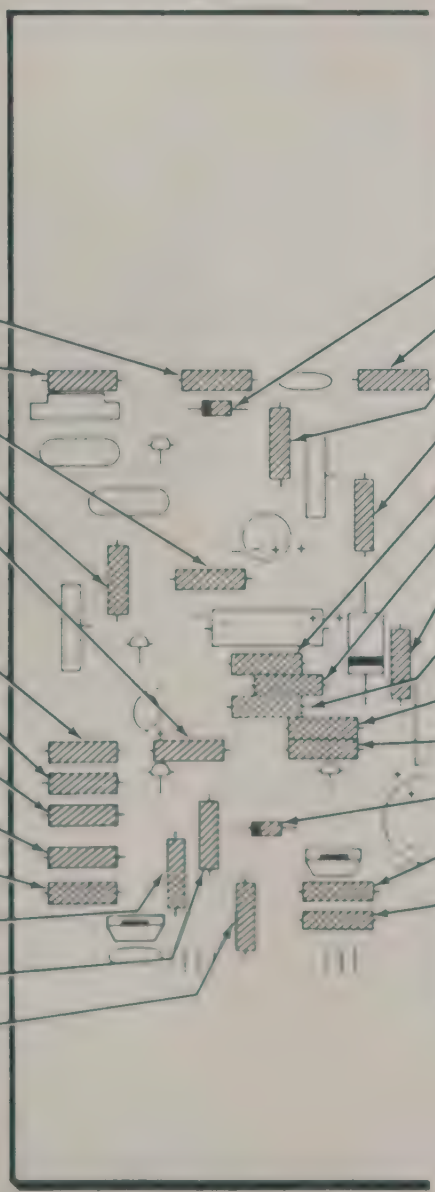
( ) R245: 470 Ω (yel-viol-brn).

( ) R243: 15 Ω (brn-grn-blk).

( ) R239: 10 kΩ (brn-blk-org).

( ) R247: 2.7 Ω (red-vlol-gold).

( ) Solder the leads to the foil and cut off the excess lead lengths.



## CONTINUE

NOTE: When you install a diode, always match the band on the diode with the band mark on the circuit board. A DIODE WILL NOT WORK IF IT IS INSTALLED BACKWARDS.

( ) D201: 1N4149 diode (#56-56).

( ) R221: 470 Ω (yel-viol-brn).

( ) R222: 1500 Ω (brn-grn-red).

( ) R225: 22 kΩ (red-red-orange).

( ) R231: 6200 Ω (grn-red-red).

( ) R232: 10 kΩ (brn-blk-org).

( ) R248: 4.7 Ω (yel-viol-gold).

( ) R233: 62 kΩ (blu-red-org).

( ) R237: 100 Ω (brn-blk-brn).

( ) R236: 1200 Ω (brn-red-red).

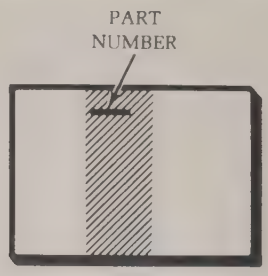
( ) D202: MZ2360 diode (#56-73).

( ) R242: 22 kΩ (red-red-org).

( ) R246: 2.7 Ω (red-vlol-gold).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-1




**START**

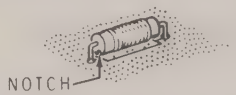
( ) R214: 1000 Ω (brn-blk-red).

( ) R217: 75 Ω (viol-grn-blk).

( ) R219: 22 Ω (red-red-blk).

( ) R218: 33 Ω (org-org-blk).

( ) L201: 4.7 μH choke (#45-39). Be sure to bend the leads toward the notch in the choke body.




( ) R202: 4700 Ω (yel-viol-red).

NOTE: Do not use the stranded wire unless stranded wire is specifically called for.

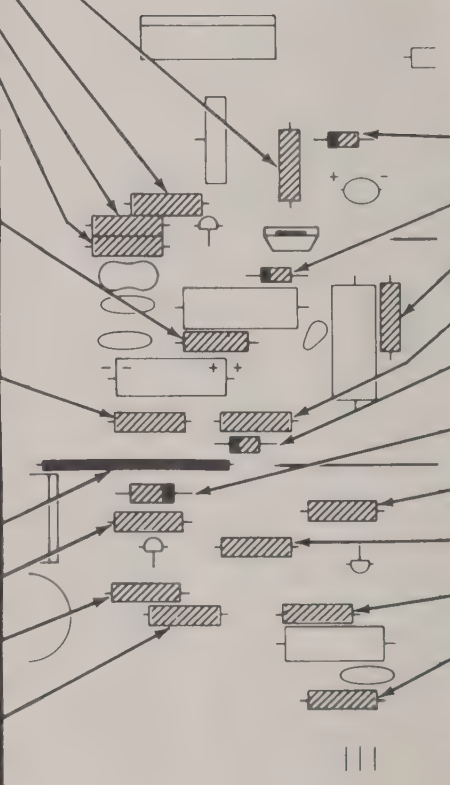
( ) 1-7/8" black solid wire.

( ) R203: 1000 Ω (brn-blk-red).

( ) R208: 1870 Ω, 1% (brn-gry-viol-brn-brn).

( ) R207: 6490 Ω, 1% (blu-yel-wht-brn-brn).

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

NOTE: Be sure to install the following diodes with the banded end as shown on the circuit board.

( ) D205: 6.2 V zener diode (#56-58).

( ) D206: FD333 diode (#56-93).

( ) R213: 47 Ω (yel-viol-blk).

( ) R201: 1 MΩ (brn-blk-grn).

( ) D204: 1N4149 diode (#56-56).

Do not install this part at this time.

( ) R204: 6800 Ω (blu-gry-red).

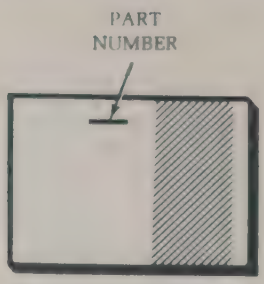
( ) R205: 4700 Ω (yel-viol-red).

( ) R209: 1000 Ω (brn-blk-red).

( ) R206: 100 Ω (brn-blk-brn).

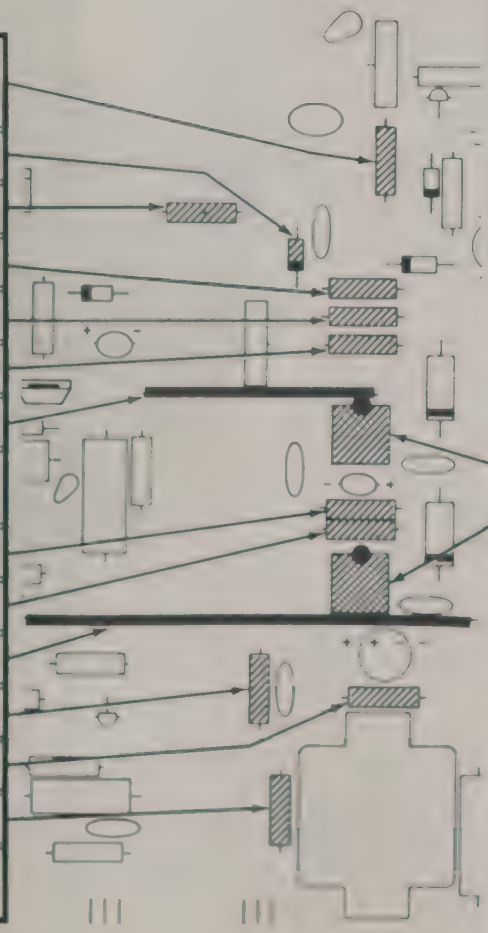
( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 4-2**



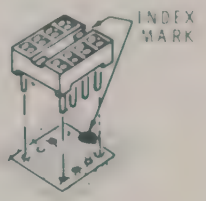

## START

- [ ] R267: 47 kΩ (yel-viol-org). NOTE: The circuit board may be printed "82 K" at this location.
- [ ] D207: 1N4149 diode (#56-56).
- [ ] R249: 1000 Ω (brn-blk-red)
- [ ] R251: 22 kΩ (red-red-orange)
- [ ] R252: 27 kΩ (red-viol-org)
- [ ] R254: 8200 Ω (gry-red-red)
- [ ] 2-1/4" black solid wire
- [ ] Solder the leads to the foil and cut off the excess lead lengths.
- [ ] R255: 27 kΩ (red-viol-org)
- [ ] R256: 3900 Ω (org-wht-red)
- [ ] 3-3/4" black solid wire
- [ ] R257: 200 Ω (red-blk-brn)
- [ ] R258: 47 Ω (yel-viol-blk)
- [ ] R250: 3900 Ω (org-wht-red).
- [ ] Solder the leads to the foil and cut off the excess lead lengths.



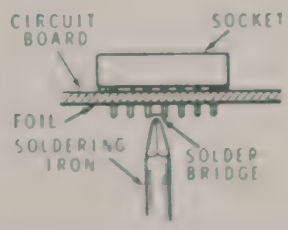
## CONTINUE

NOTE: When you install IC sockets, position the socket so that the index mark on the circuit is visible after the socket is installed. Be sure all of the pins go through the circuit board. Solder each pin to the foil.



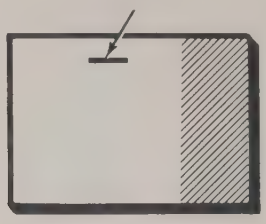

- [ ] U201: 8-pin IC socket.
- [ ] U202: 8-pin IC socket.

Carefully check each socket for solder bridges between pins. If a solder bridge has occurred, hold the circuit board foil side-down as shown and hold the soldering iron tip between the two points that are bridged. The solder will flow down the soldering iron tip or use the de-solder braid.




PICTORIAL 4-3

PART
NUMBER



**START**

( ) R269: 82 kΩ (gry-red-org).

( ) R274: 4700 Ω (yel-viol-red).

( ) D213: 1N4149 diode (#56-56).

( ) D212: 1N2071 diode (#57-27).

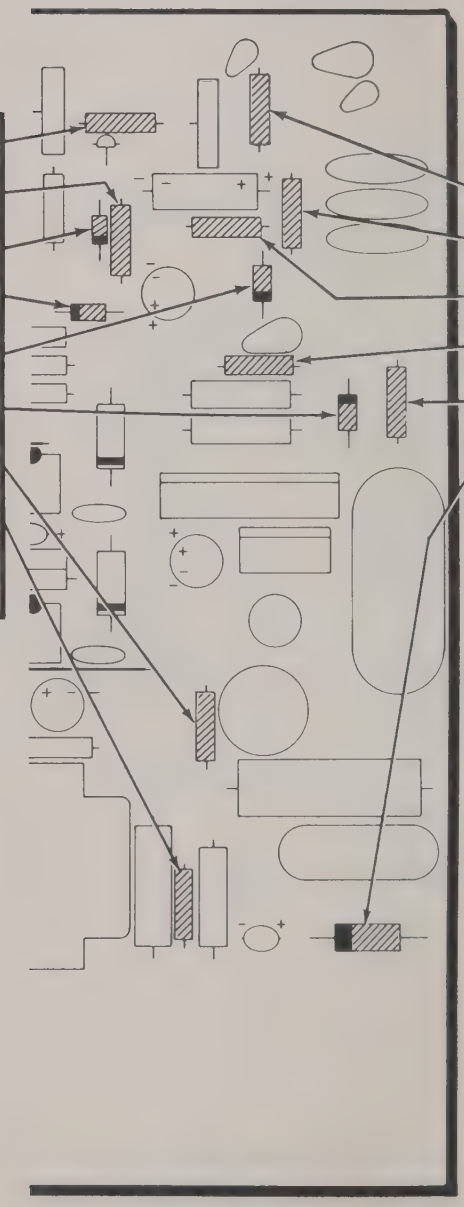
( ) D209: 1N2071 diode (#57-27).

( ) D211: DRS-110 diode (#57-64).

( ) R273: 1000 Ω (brn-blk-red).

( ) R262: 100 Ω (brn-blk-brn).

( ) Solder the leads to the foil and cut off the excess lead lengths.



**CONTINUE**

( ) R275: 3.3 MΩ (org-org-grn).

( ) R272: 390 kΩ (org-wht-yel).

( ) R266: 330 Ω (org-org-brn).

( ) R265: 100 kΩ (brn-blk-yel).

( ) R276: 3.3 MΩ (org-org-grn).

( ) D208: MR508 diode (#57-614).

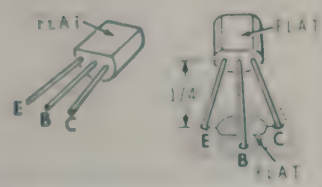
( ) Solder the leads to the foil and cut off the excess lead lengths.

**PICTORIAL 4-4**

## START

NOTE: In the following steps, install each of the transistors as follows:

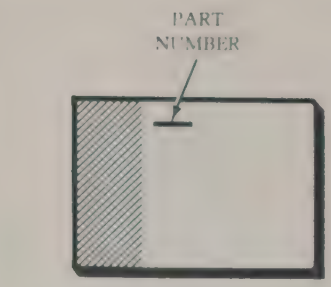
1. Refer to the illustration example below and identify the E, B, and C leads of the transistor.
2. Bend the B lead of each transistor **toward the flat**.
3. Insert the transistor leads into the corresponding E, B, and C holes in the circuit board.
4. Position the transistor approximately 1/4" above the circuit board.
5. Turn the circuit board over, solder the leads to the foil, and cut off the excess lead lengths.

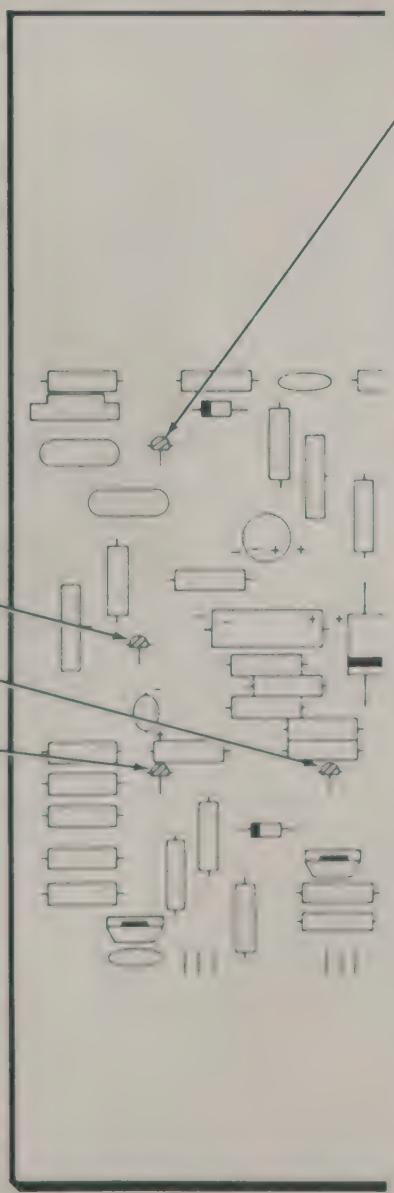



( ) Q202: MPSA65 transistor (#417-885).

( ) Q203: MPSA56 transistor (#417-822)

( ) Q204: MPSA06 transistor (#417-821).

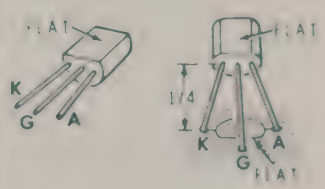


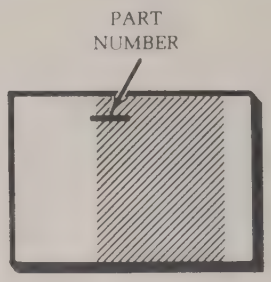
## CONTINUE

( ) Q201: MPU131 (#417-823). Install this transistor as follows:

1. Refer to the illustration and identify the K, G, and A leads of the diodes.
2. Match the flat on the transistor with the outline of the flat on the circuit board. Insert the leads into the corresponding K, G, and A holes in the circuit board.
3. Position the transistor approximately 1/4" above the circuit board. Then turn the board over, solder the leads to the foil, and cut off the excess lead lengths




PICTORIAL 4-5




**START**

( ) Q218: MPSA93 transistor (#417-927).

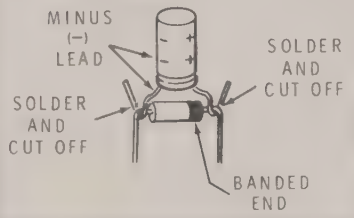
( ) Q215: 2N3904 transistor (#417-875).

( ) Q212: 2N3906 transistor (#417-874).

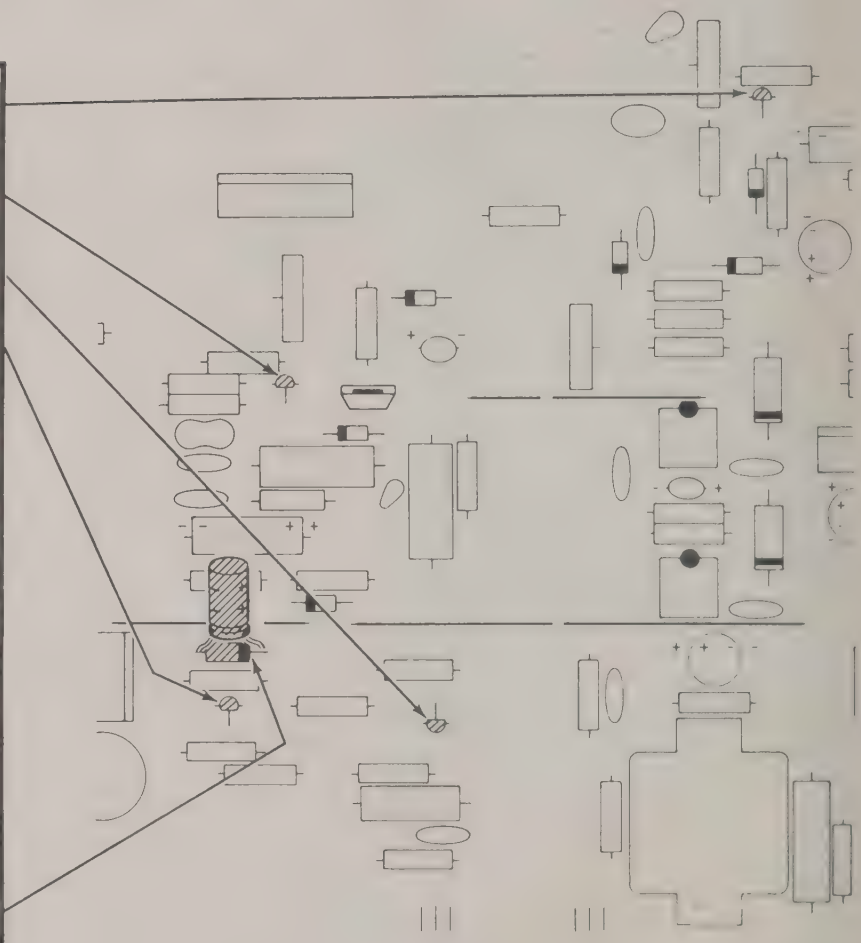
( ) Q209: MPSL01 transistor (#417-811).

NOTE: In the following step, be sure to use the **25 V** electrolytic capacitor.

( ) Prepare a 12.8 V zener diode (#56-94), 22 $\mu$F, **25 V** electrolytic capacitor combination. Be sure to connect the minus (−) lead to the unbanded end of the diode. Solder the leads.



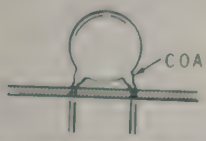

( ) D203/C239: Diode, electrolytic combination. Insert the capacitor leads through the circuit board and solder them to the foil. Then cut off the excess lead lengths. NOTE: Make sure you have positioned the banded end of the diode as shown on the circuit board.



PICTORIAL 4-6

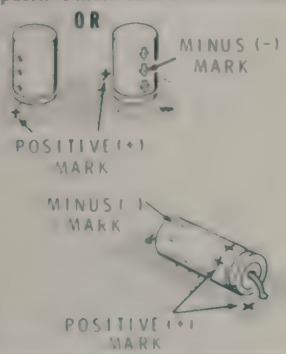
## START

NOTE: When you install ceramic capacitors, space the capacitor about 1/8" above the circuit board. This will prevent the coating on the leads from protruding through the circuit board and making soldering difficult.




( ) C208: .01 μF ceramic.

NOTE: When you install electrolytic capacitors, be sure to position the positive (+) lead of the capacitor toward the positive mark on the circuit board.



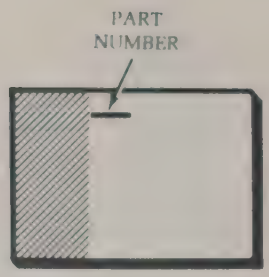

( ) C209: 47 μF electrolytic.

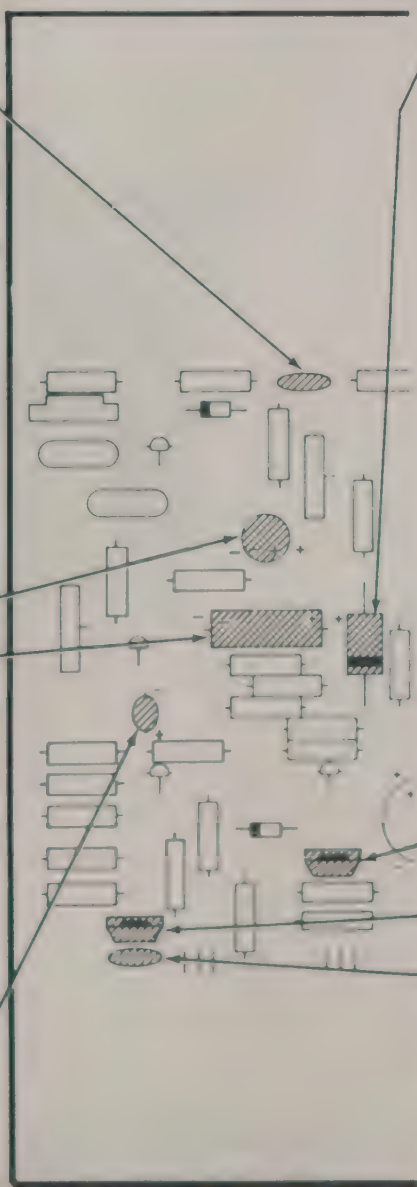
( ) C215: 10 μF electrolytic.

NOTE: When you install the tantalum electrolytic capacitor, be sure to position the plus (+) marked or dot (•) marked lead in the plus (+) marked hole.

( ) C213: 4.7 μF tantalum.

( ) Solder the leads to the foil and cut off the excess lead lengths.



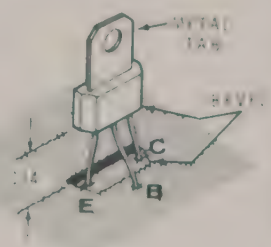



## CONTINUE

( ) C214: 6800 pF polystyrene. Position the marked end of the capacitor towards the banded end on the circuit board.

Install the next two transistors as follows:

1. Position the transistor so the metal tab, which is closer to one side of the transistor, is toward the wide line of the circuit board outline. Also note the bevel as shown.
2. Insert the transistor leads in holes E, B, and C.
3. Position the transistor approximately 1/4" above the board. Solder the leads to the foil and cut off the excess lead lengths.



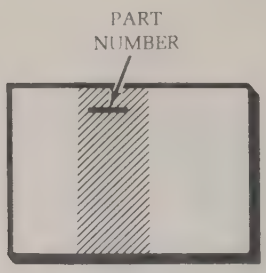

( ) Q205: MPSU06 transistor (#417-926)

( ) Q206: MPSU06 transistor (#417-926)

( ) C216: 56 pF ceramic.

( ) Solder the leads to the foil and cut off the excess lead lengths.

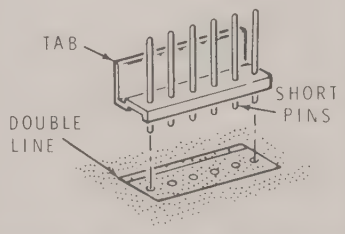
PICTORIAL 4-7




## START

Install the plugs as follows:

1. Match the tab side of the plug with the double line of the outline on the board.
2. Insert the short pins in the holes and solder them to the foil.




( ) P202: 6-pin plug.

( ) C207: 390 pF mica.

( ) C206: .01 μF ceramic.

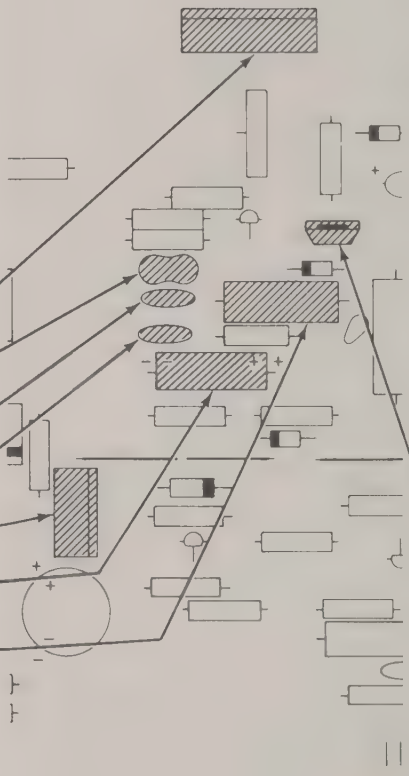
( ) C203: .01 μF ceramic.

( ) P201: 4-pin plug.

( ) C202: 10 μF electrolytic.

( ) R215: 820Ω, 2-watt (gry-red-brn).

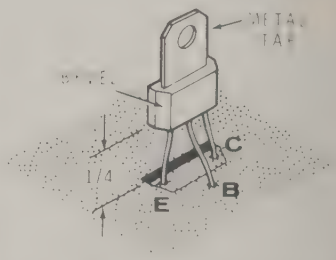
( ) Solder the leads to the foil and cut off the excess lead lengths.



## CONTINUE

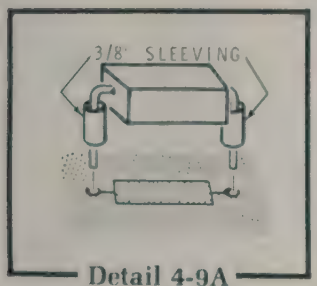
Install the next transistor as follows:

1. Position the transistor so the metal tab, which is closer to one side of the transistor, is **toward** the wide line of the circuit board outline.
2. Insert the transistor leads in holes E, B, and C.
3. Position the transistor approximately 1/4" above the board. Solder the leads to the foil and cut off the excess lead lengths.




( ) Q214: MPSU 10 transistor (#417-834)

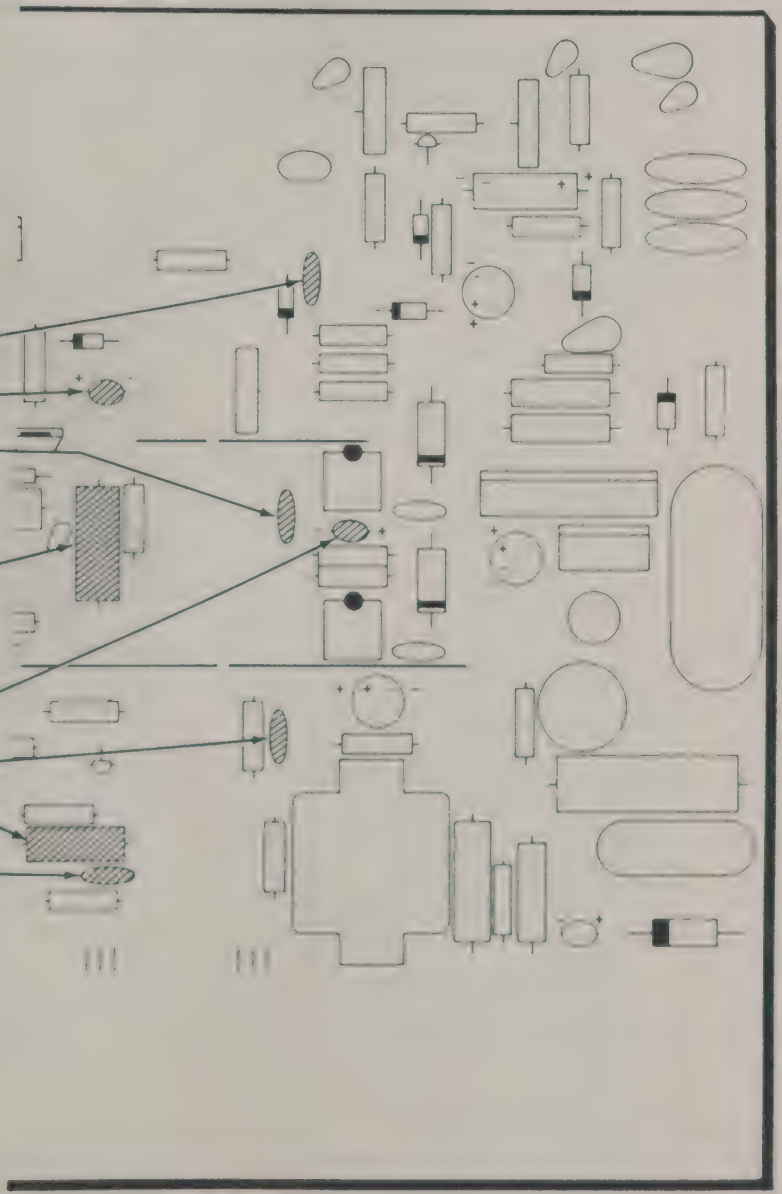
**PICTORIAL 4-8**




Detail 4-9A

**START**

- ( ) C218: 100 pF ceramic.
- ( ) C205: 10 μF tantalum.
- ( ) C222: 100 pF ceramic.
- ( ) R212: 1500 Ω, **5-watt**, wirewound. Refer to Detail 4-9A and cut two 3/8" pieces of white sleeving and slide them over the leads. Bend the leads and install the resistor into the circuit board holes. Cut off the excess lead lengths.
- ( ) C204: 10 μF tantalum.
- ( ) C225: .047 μF Mylar.
- ( ) R211: 51 Ω, **2-watt** (grn brn silv)
- ( ) C201: .001 μF ceramic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 4-9

**START**

( ) C231: 1.5 $\mu$F electrolytic.

Install 1.2 Ω, 2-watt, 10% (brn-red-gld) resistors at the following locations.

( ) R264 .....
( ) R263 .....

( ) C221: 4700 pF polystyrene. Position the banded end as shown on the circuit board.

( ) C219: .01 $\mu$F ceramic.

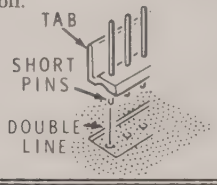
( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) P203: 8-pin plug.

Install the plug as follows:

1. Match the tab side of the plug with the double line of the outline on the board.

2. Insert the short pins in the holes and solder them to the foil.




( ) P204: 4-pin plug.

( ) C224: 4700 pF polystyrene.

( ) C223: .01 $\mu$F ceramic.

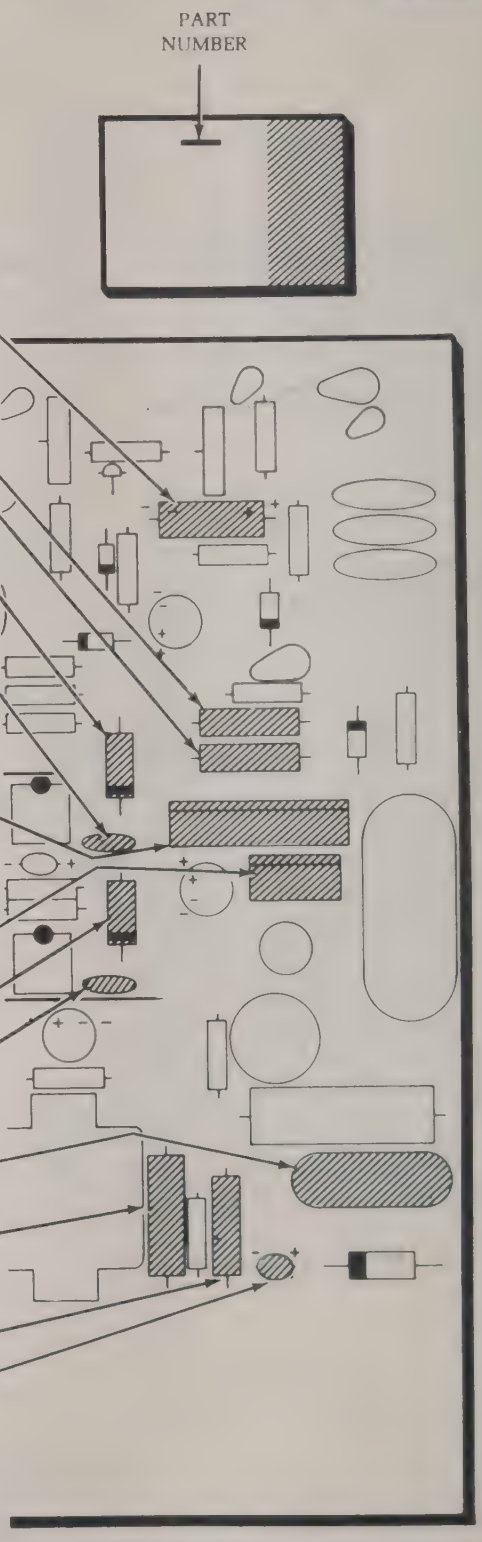
( ) C229: .006 $\mu$F polypropylene.

( ) L203: 8.8 $\mu$H choke (#45-42). Bend the leads toward the slots in the coil form.

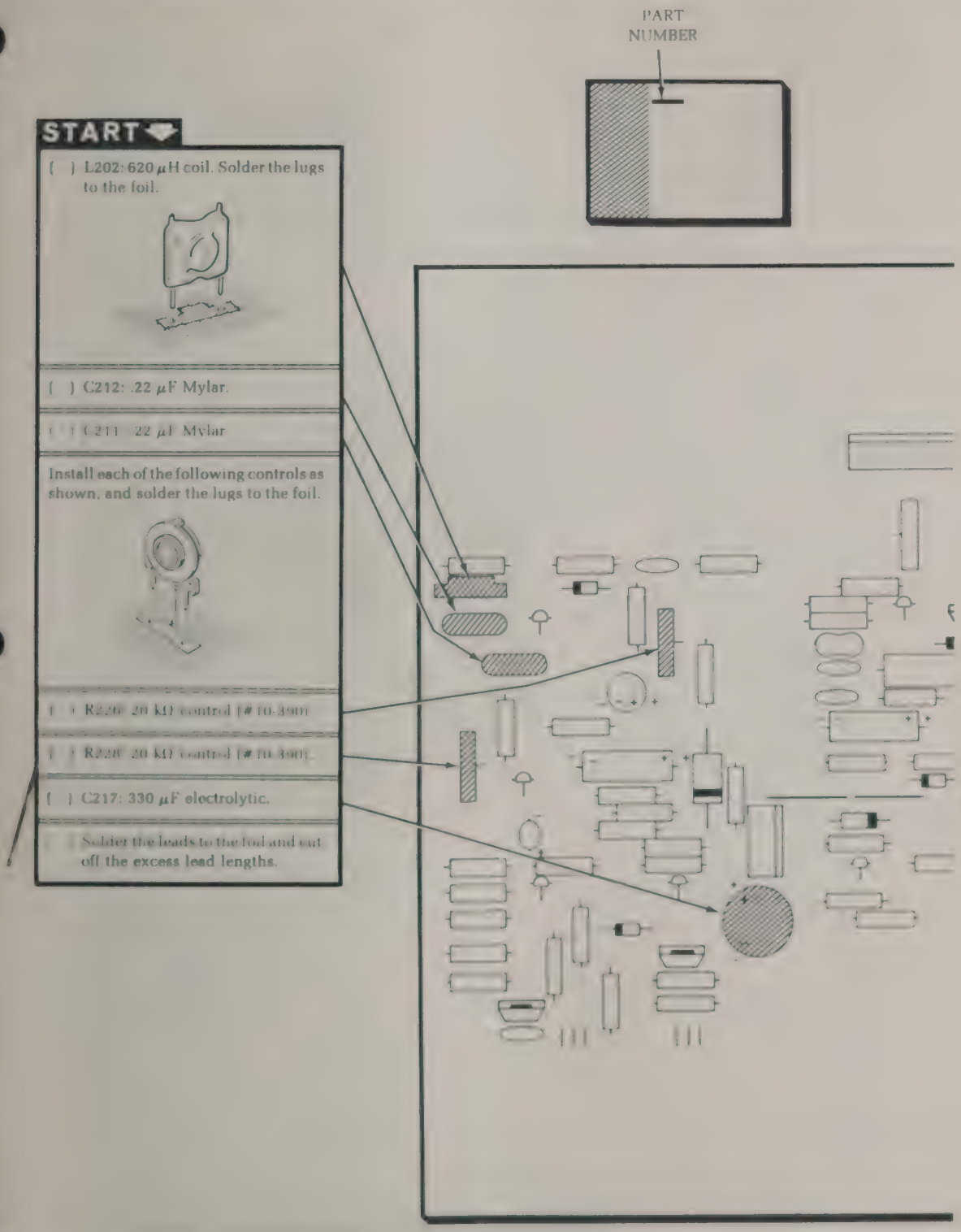
( ) R263: 1.2 Ω, 2-watt, 10% (brn-red-gld).

( ) C227: 10 $\mu$F tantalum.

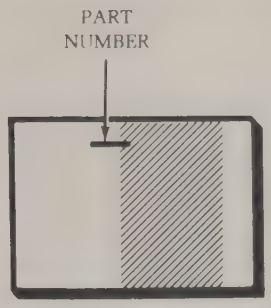
( ) Solder the leads to the foil and cut off the excess lead lengths.




**PICTORIAL 4-10**


PART
NUMBER
START
( ) L202: 620 μH coil. Solder the lugs to the foil.
( ) C212: .22 μF Mylar.
( ) C211: .22 μF Mylar
Install each of the following controls as shown, and solder the lugs to the foil.
( ) R220: 20 kΩ control [# 10-390]
( ) R228: 20 kΩ control [# 10-390]
( ) C217: 330 μF electrolytic.
( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 4-11




**START**

( ) R268: 100 kΩ control (#10-941).

( ) C234: .005 μF ceramic spark gap.

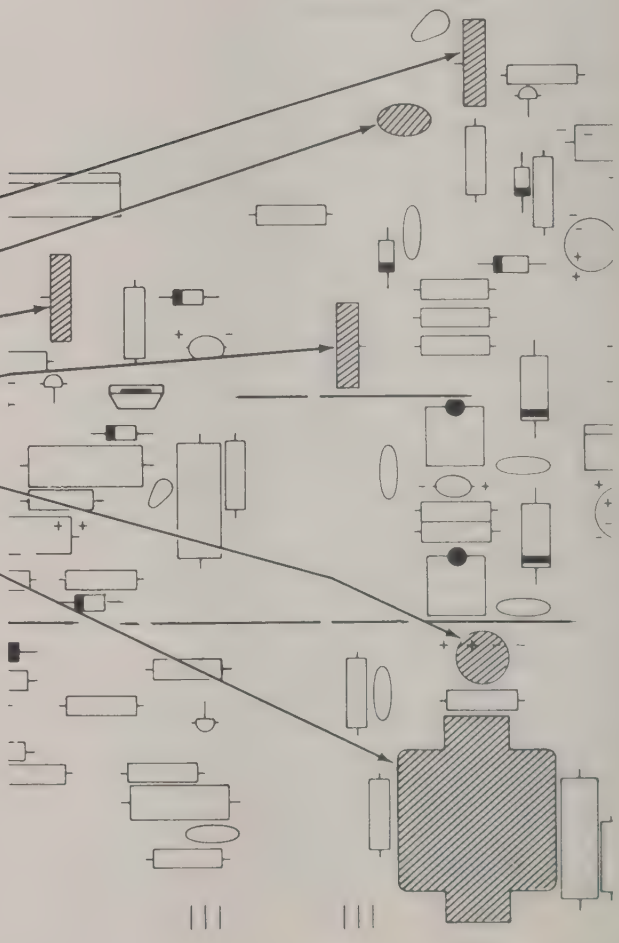
( ) R216: 500 Ω control (#10-918).

( ) R253: 5000 Ω (5 k) control (#10-311).

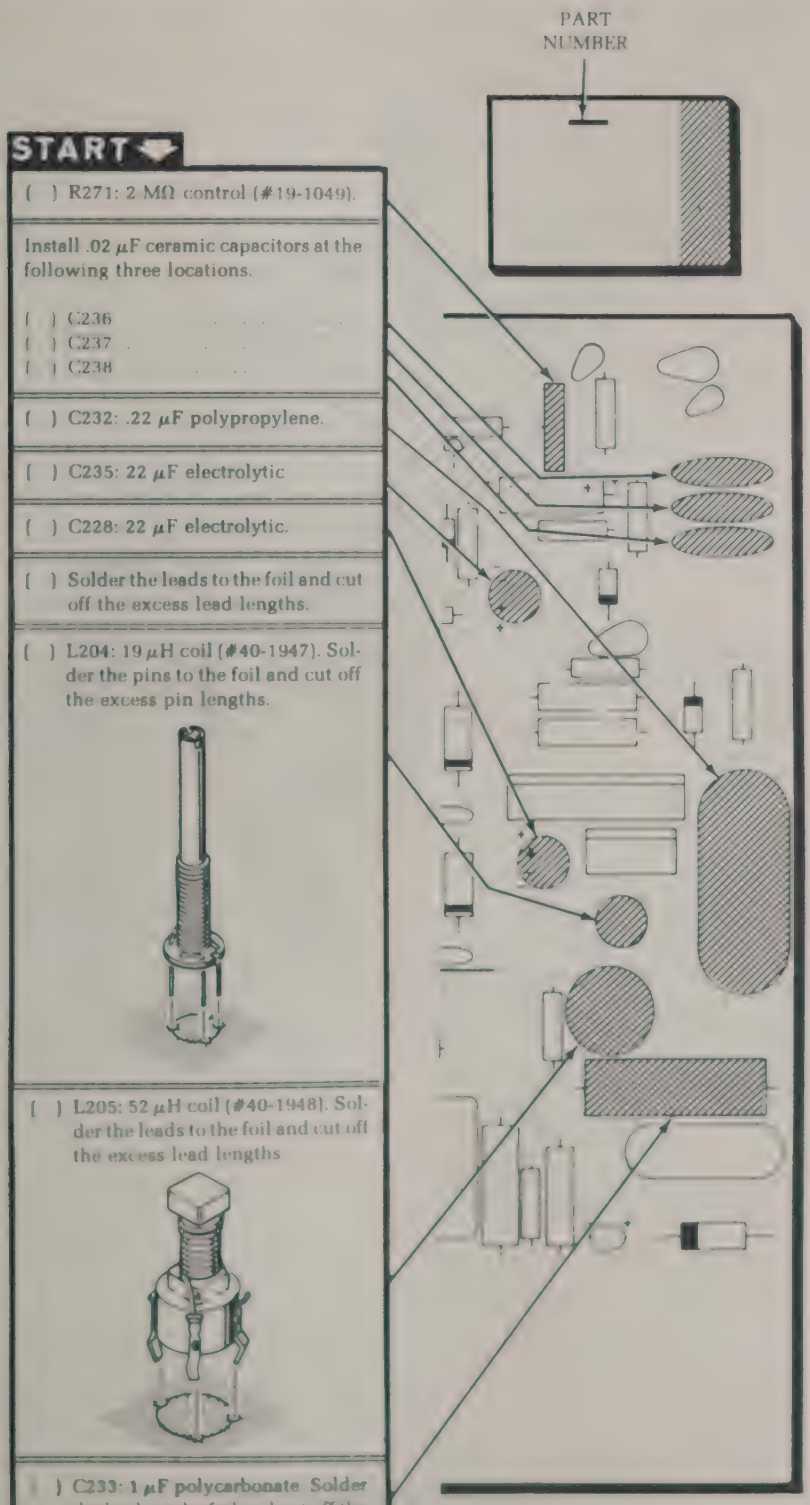
( ) C226: 22 μF electrolytic.

( ) T201: Driver transformer (#51-197). NOTE: This part is located in the main pack.

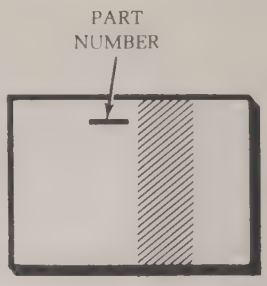
( ) Solder the leads to the foil and cut off the excess lead lengths.



PICTORIAL 4-12


PART
NUMBER
START
( ) R271: 2 MΩ control (#19-1049).
Install .02 μF ceramic capacitors at the following three locations.
( ) C236
( ) C237
( ) C238
( ) C232: .22 μF polypropylene.
( ) C235: 22 μF electrolytic
( ) C228: 22 μF electrolytic.
( ) Solder the leads to the foil and cut off the excess lead lengths.
( ) L204: 19 μH coil (#40-1947). Solder the pins to the foil and cut off the excess pin lengths.
( ) L205: 52 μH coil (#40-1948). Solder the leads to the foil and cut off the excess lead lengths
( ) C233: 1 μF polycarbonate Solder the leads to the foil and cut off the excess lead lengths

PICTORIAL 4-13

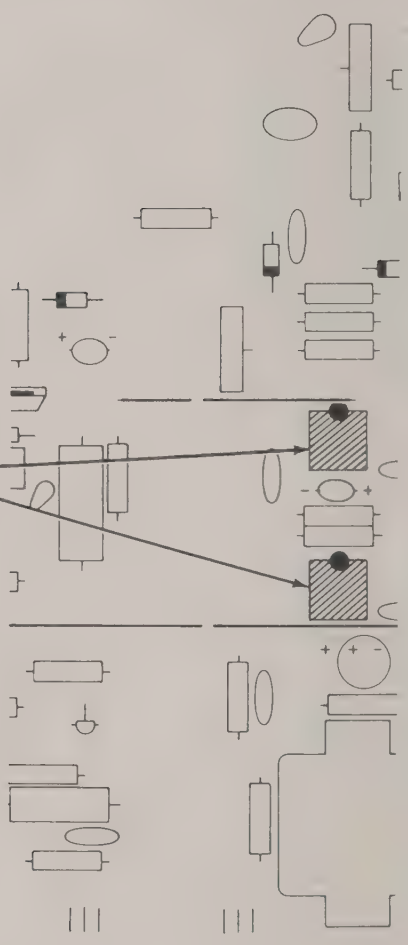


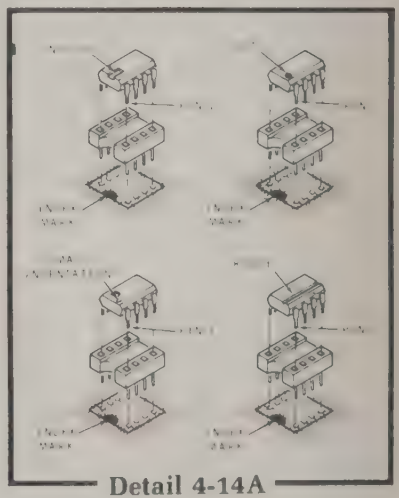

**START**

Install NE555V integrated circuits (#442-53) at the two following locations. Refer to Detail 4-14A and identify pin 1. Then position pin 1 at the index mark on the circuit board.

( ) U201 .....
( ) U202 .....

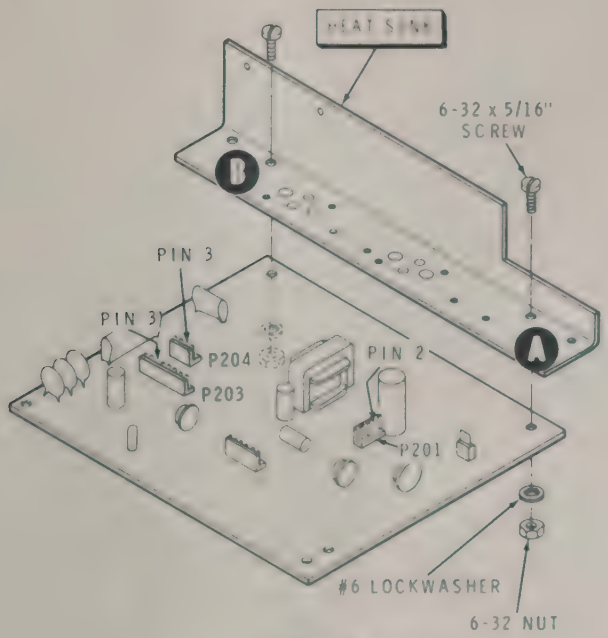
**FINISH**





Detail 4-14A

**PICTORIAL 4-14**




**Detail 4-15A**

Refer to Pictorial 4-15 (Illustration Booklet, Page 12) for the following steps.

( ) Position the video circuit board as shown.

( ) Locate the large heat sink and wipe it clean with a cloth to remove dust and any small metal particles.

Refer to Detail 4-15A and cut off the following plug pins close to the plug bodies.

( ) P201 pin 2.
( ) P203 pin 3.
( ) P204 pin 3.

( ) Refer to Detail 4-15A and mount the large heat sink to the circuit board at A and B with two 6-32 × 5/16" screws, two #6 lockwashers, and two 6-32 nuts. NOTE: Do not tighten these screws at this time.

WARNING: You will be using Dow Corning 340 thermal compound in the following steps. Although this compound is not caustic, it may cause temporary discomfort if it gets into your eyes. If this should happen, rinse your eyes with warm water. If the compound gets on your clothing, the clothes may require professional cleaning, so handle the compound carefully. This compound contains zinc oxides, $SiO_2$ and slight traces of $CO_2$.

( ) Locate the thermal compound pod that was used earlier.

( ) Q213: Refer to Detail 4-15B and mount an MJ2841 transistor (#417-282) at Q213 as follows:

1. Place a black shoulder washer into each of the two transistor mounting holes with the larger part positioned down against the circuit board.

2. Apply a small amount of thermal compound on the heat sink at Q213.

3. Position the transistor insulator on the heat sink at Q213. (Note the wide space.) Apply more thermal compound to the top of the insulator.

4. Insert the transistor leads through the circuit board and mount the transistor with two 4-40 × 1/2" screws, #4 lockwashers, and 4-40 nuts.

5. Solder both of the transistor leads to the circuit board foil and cut off the excess lead lengths.

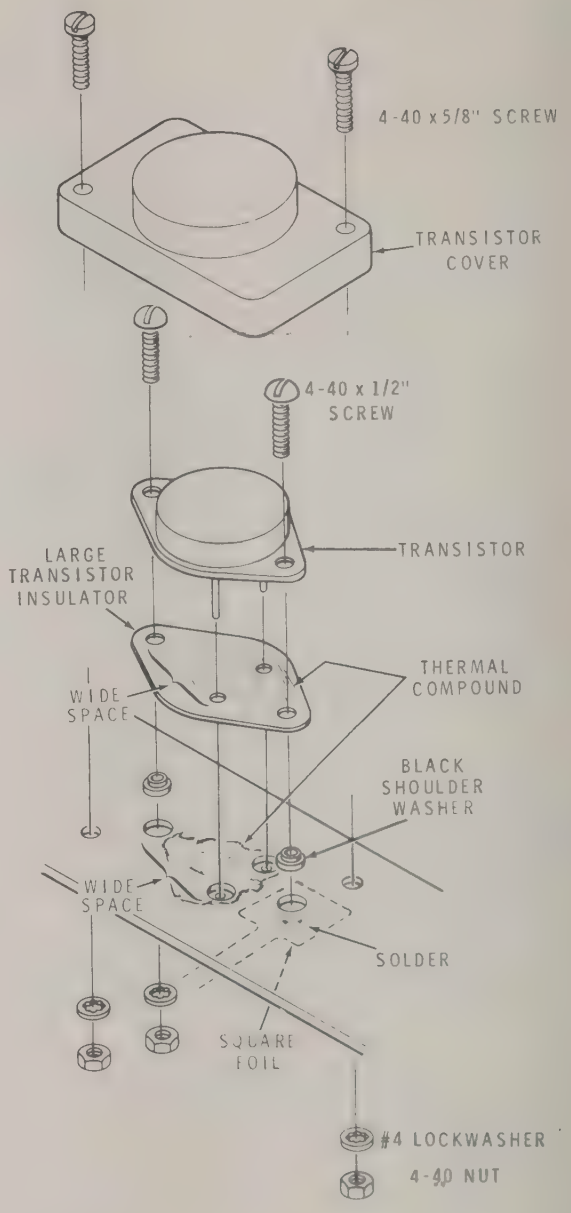
6. Solder the nut of the transistor mounting hardware to the square foil. The other nut does not have foil around it.

( ) Q217: In the same manner, mount a BU500 transistor (#417-923) at Q217.

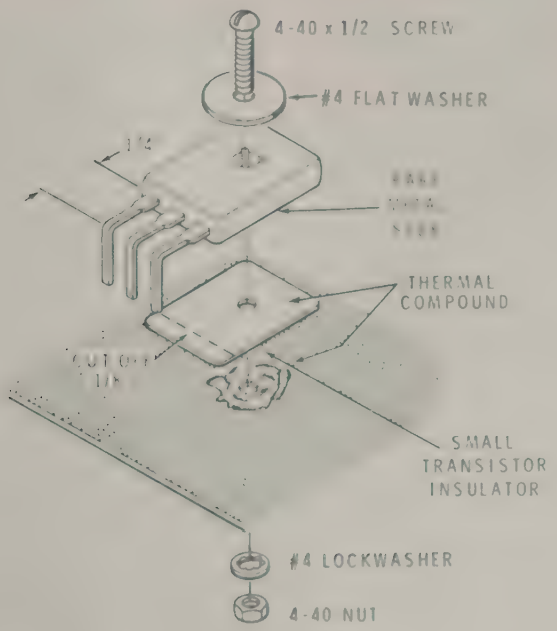
( ) Mount a transistor cover over transistor Q213 with two 4-40 × 5/8" screws, #4 lockwashers, and 4-40 nuts.

( ) In the same manner, mount a transistor cover over transistor Q217.

( ) Tighten the two heat sink mounting screws.




**Detail 4-15B**




**Detail 4-15C**

( ) Q207: Refer to Detail 4-15C and mount an MJE182 transistor (#417-932) as follows:

1. Apply a small amount of thermal compound on the heat sink at Q207.
2. Locate a small transistor insulator and cut 1/8" off the lower edge. Then place this insulator onto the heat sink at Q207.
3. Apply more thermal compound to the top of the insulator.
4. Bend the leads of transistor 90° toward the bare metal side. The bend should be 1/4" from the bottom of the transistor.
5. Insert the transistor leads into the B, C and E holes in the circuit board. Then mount the transistor with a 4-40 × 1/2" screw, a #4 lockwasher, a #4 flat washer and a 4-40 nut. Do not overtighten this hardware.
6. Solder the transistor leads to the foil and cut off the excess lead lengths.

( ) Q211: In the same manner, mount an MJE172 transistor (#417-924) at heat sink location Q211.

( ) Q216: Again, mount an MJE340 transistor (#417-195) at Q216.

( ) Q208: Mount an MJE172 transistor (#417-924) at Q208. Do not use an insulator with this transistor. Apply thermal compound to the transistor.

## CIRCUIT BOARD VISUAL CHECK

It is important that the following checkout procedure be done after the circuit board is completed.

Carefully inspect the foil side of the circuit board for the following most commonly made errors.

( ) Unsoldered connections.

( ) Poor solder connections.

( ) Solder bridges between foil patterns. NOTE: If you suspect a solder bridge, check the foil on the circuit board against the foil pattern shown in the X-Ray View section of the Operation Manual.

( ) Protruding leads which could touch together.

When you make the following visual checks, refer to the Pictorial where the part was installed and check it against the installation instructions.

( ) Check the diodes for proper installation.

( ) Check the transistors for proper installation.

( ) Check the integrated circuits for proper installation.

( ) Check the electrolytic and tantalum capacitors for the correct position of the positive (+) end.

( ) Check the plugs for proper installation.

( ) Locate the CRT socket with leads and cut 2" off the end of the yellow lead. Prepare the end of the yellow lead. Then solder the leads to the circuit board holes as follows:

( ) Black to GND. (Use either hole.)

( ) Red to G2.

( ) White to G4.

( ) Green to G1.

( ) Both brown leads to FIL.

( ) Yellow to K.

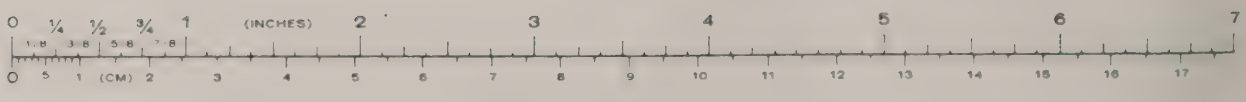
( ) Cut off any excess lead length on the foil side of the circuit board.

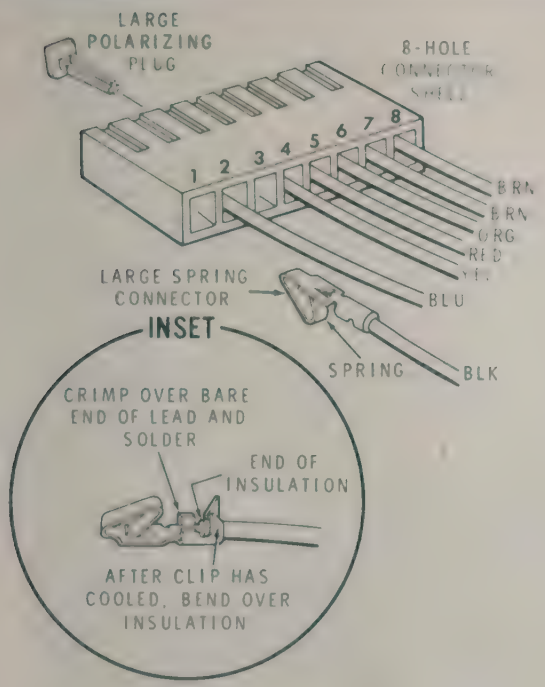
( ) Install a small cable tie around all of the leads coming from the CRT socket, except for the yellow lead. Position this tie approximately 4" from the socket. Position the yellow lead away from the other leads.

( ) Prepare a 7-1/4" black stranded wire. Then crimp and solder a push-on connector on one end of the black wire.

( ) Solder the other end of this black wire to the other hole marked GND on the circuit board.

( ) Locate the flyback transformer in the main pack and cut the bare end of each lead to 1/8".






**Detail 4-15D**

( ) Refer to the inset drawing on Detail 4-15D and crimp and solder a large spring connector onto each flyback transformer lead.

Refer to Detail 4-15D and insert the flyback transformer leads into an 8-hole connector shell as follows. Be sure to position the slotted side of the shell as shown.

( ) Black in hole 1.

( ) Blue in hole 2.

( ) None in hole 3.

( ) Yellow in hole 4.

( ) Red in hole 5.

( ) Orange in hole 6.

( ) Either brown in hole 7.

( ) Other brown in hole 8.

( ) Refer to Detail 4-15D and insert a large polarizing plug in hole 3.

( ) Install a small cable tie around the flyback transformer leads approximately 2" from the transformer.

NOTE: In the next step, when you remove the nuts from the flyback transformer mounting bracket, be sure to hold the transformer halves together or they will come apart.

( ) Remove the two 4-40 nuts (and the rubber band, if there is one) from the flyback transformer mounting bracket. Mount the transformer to the heat sink at C and D with two #4 lockwashers and the two 4-40 nuts. Do not overtighten the nuts.

( ) Remove the backing paper from the "DANGER" label and press the label to the front of the heat sink under the flyback transformer.

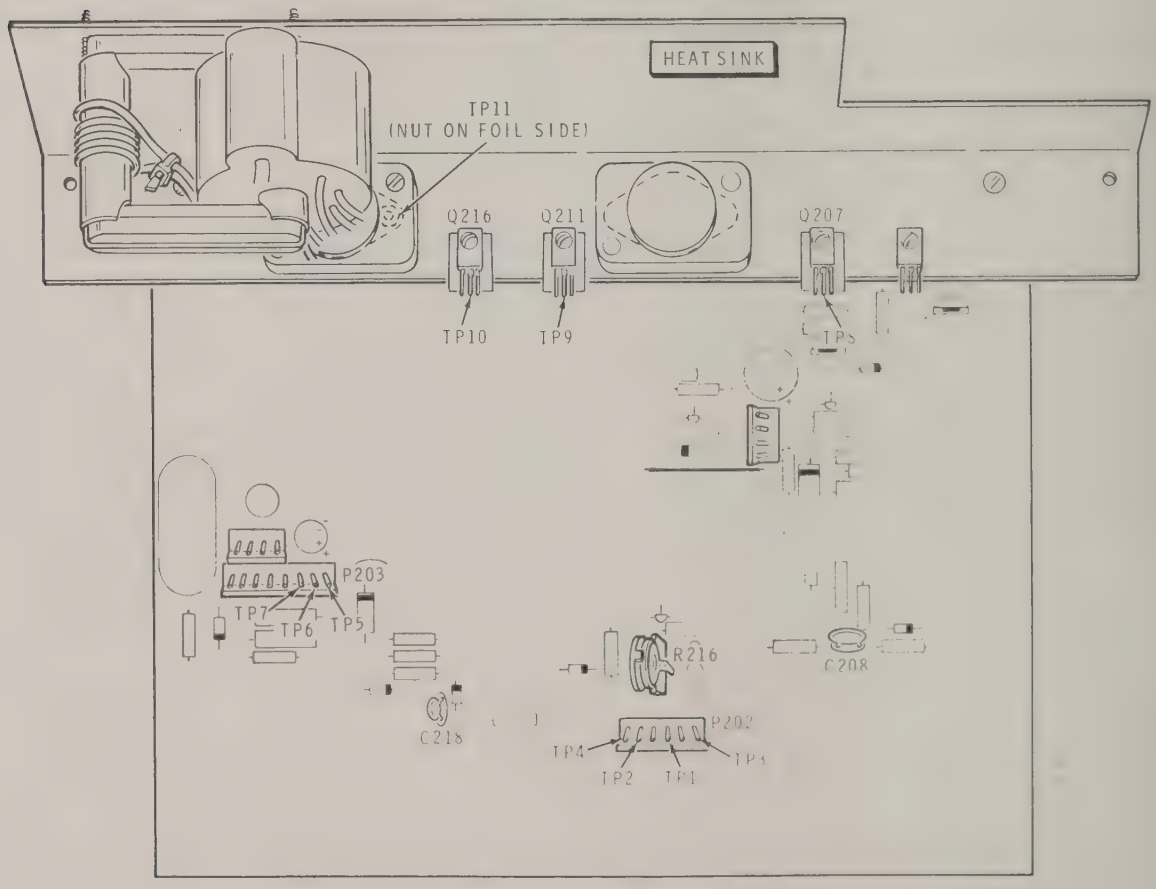
# INSTALLATION AND CHECKOUT

## POWER OFF TESTS

Refer to Pictorial 4-16 for the following steps.

( ) Set your ohmmeter to the ×1000 range if the range is not indicated otherwise.

( ) Connect the negative meter lead to the video circuit board heat sink. Leave the lead at this location for the following tests.




PICTORIAL 4-16

Perform the following resistance measurements on the video circuit board. If you obtain the correct meter reading, proceed to the next test. If you do not obtain the correct reading, refer to the "Possible Area of Trouble" column.

NOTE: A Heath vacuum tube voltmeter was used to make these measurements. If you are using a digital type or other than vacuum tube type meter, your measurements may vary.

| POSITIVE METER LEAD TO: | APPROXIMATE METER READING | POSSIBLE AREA OF TROUBLE (Refer to "Possible Circuit Board Problems" on Page 96.) |
|---|---|---|
| TP1 | Greater than 150 Ω (ohmmeter range ×100) | 1. Transistor Q215 |
| TP2 | Greater than 5000 Ω | 1. Transistors Q211, Q212, Q213. |
| TP3 | INFINITE | 1. Solder bridge on foil. |
| TP4 | INFINITE | 1. Solder bridge on foil. |
| TP5 | Greater than 100 kΩ | 1. Solder bridge on foil. |
| TP6 | INFINITE | 1. Solder bridge on foil. |
| TP7 | Greater than 2000 Ω | 1. Capacitor C228. |
| TP8 | Greater than 2000 Ω | 1. Transistors Q205, Q207. |
| TP9 (collector of Q211). | Greater than 2000 Ω | 1. Transistors Q211, Q212. |
| TP10 (collector of Q216). | Greater than 2000 Ω | 1. Transistor Q216.<br>2. T201. |
| TP11 (nut on foil side). | INFINITE | 1. Transistor Q217.<br>2. Diode D208. |

( ) Disconnect the meter leads.

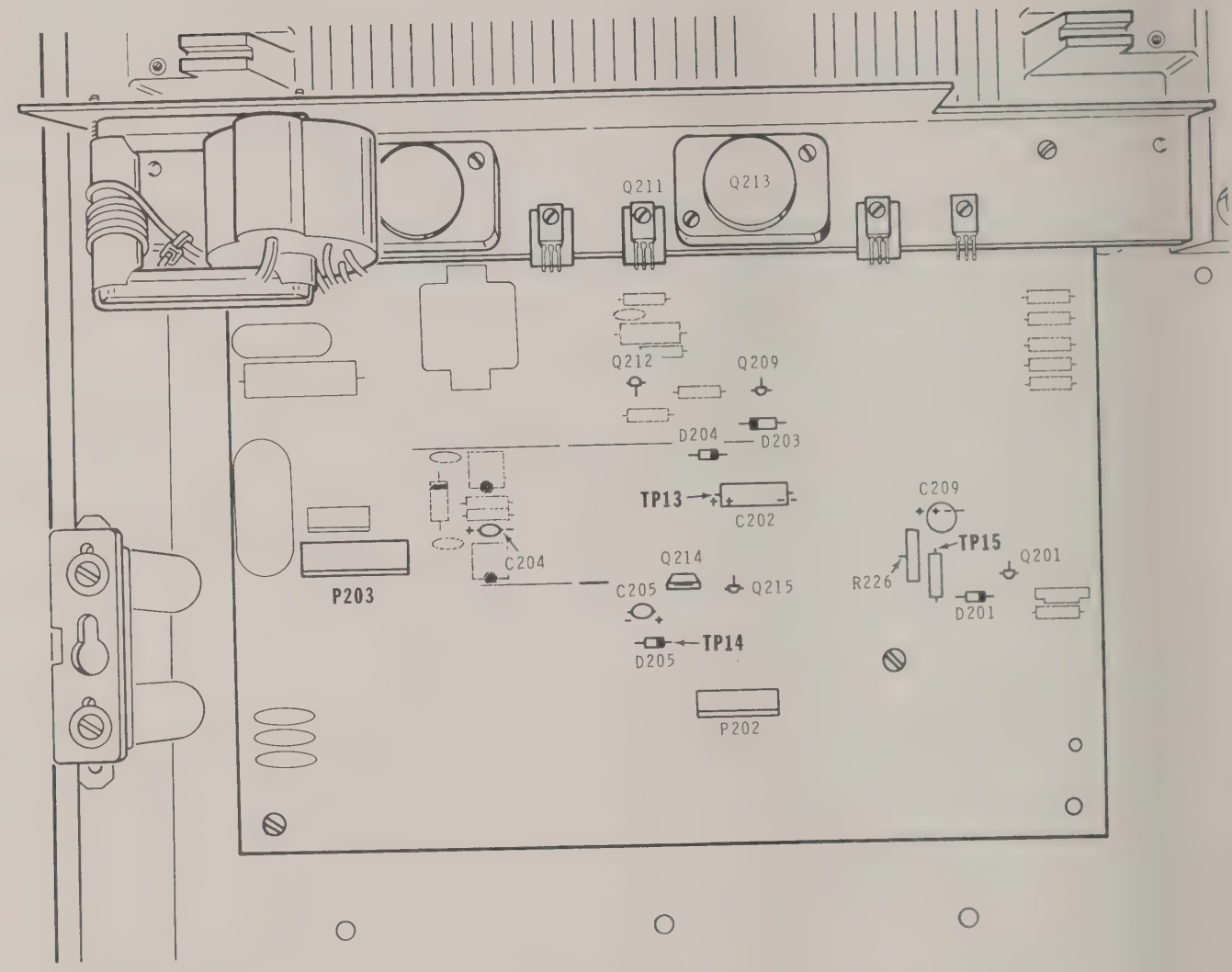
NOTE: In the following steps, remove the necessary parts and hardware from the final pack.

( ) Refer to Pictorial 4-17 (Illustration Booklet, Page 12) and mount the video circuit board to the terminal base with four 6-32 × 3/8" screws. Be sure to position the harness and all other wires except the green wire on top of the circuit board.

( ) Position the black ground wire (coming from GND on the video circuit board) over the edge of the base so it does not touch other connections.

( ) Push the 6-hole connector on the harness onto plug P202 on the video circuit board.

( ) Connect the negative lead of your meter to the heat sink. Set your meter to read DC volts.




PICTORIAL 4-18

## POWER ON TESTS

**WARNING: MAKE SURE THAT THE FLYBACK CONNECTOR IS NOT CONNECTED TO THE CIRCUIT BOARD PLUG P203.**

Refer to Pictorial 4-18 for the following tests.

( ) Connect the line cord plug to an AC outlet and set the POWER switch to ON.

( ) Set your voltmeter to read approximately 150 volts DC. Reduce this range setting if a lower range is necessary.

( ) Make the following voltage measurements on the video circuit board. If you obtain the correct meter reading, proceed to the next test. If you do not obtain the correct reading, refer to the "Possible Area of Trouble" column.

| | POSITIVE METER LEAD TO: | APPROXIMATE METER READING | POSSIBLE AREA OF TROUBLE (Refer to "Possible Circuit Board Problems" on Page 80.) |
|---|---|---|---|
| ( ) | TP13 | 53 VDC | 1. 6-hole connector (one pin off on plug P202).<br>2. Diodes D203, D204, or D205.<br>3. Capacitor C202.<br>4. Transistors Q209, Q211, Q212, Q213 |
| ( ) | TP14 | 6.2 VDC | 1. Diodes D205 or D206.<br>2. Capacitors C202, C204, or C205.<br>3. Transistors Q214, Q215 |
| ( ) | TP15 | Approximately 7 V. vary control R226; meter reading should change | 1. Diode D201.<br>2. Capacitor C209<br>3. SCR Q201 |

( ) Set the POWER switch to OFF and disconnect the line cord.

( ) Disconnect the harness connector from plug P202 on the video circuit board.

This completes the video circuit board checkout. Proceed to "Terminal Base Assembly (Cont'd.)"

# TERMINAL BASE ASSEMBLY (Cont'd.)

## FRONT PANEL AND CRT INSTALLATION

Refer to Pictorial 5-1 (Illustration Booklet, Page 13) for the following steps.

( ) Locate the front panel and place it on your work surface on a soft cloth.

( ) Install brass inserts in the front panel at CA, CB, CC, and CD. As before, heat the inserts with your soldering iron; then push them in flush with the front panel.

( ) Mount the bezel cover to the front of the front panel with the bezel mounting plate and six 6-32 × 3/8" screws.

**WARNING**

Use extreme caution when you handle the CRT. Do not strike, scratch, or subject the picture tube to more than moderate pressure at any time. Due to its high vaccuum and large glass surface, a fracture of the glass could result in an implosion of considerable violence.

NEVER LIFT THE CRT BY ITS NECK. Always lift it by the edges around the face of the tube. When you handle the CRT, do not touch the anode socket, as you can receive an electrical shock even though the CRT has not been used.

( ) Open the CRT box so the face of the tube (not the neck) is positioned up. Then hold the CRT in the box and turn the box bottom-side-up on a padded surface.

( ) Lift the box slowly, allowing the CRT to slide out onto the padded surface.

( ) If there is a plastic film over the face of the CRT, remove it.

( ) Place the CRT face down in the front panel as shown. Note the position of the anode socket.

( ) Locate two beveled spacers, a ground connector, a #10 flat washer, and a 10 × 1-1/2" self-tapping screw. Use these parts in the next step.

( ) Refer to the inset drawing on Pictorial 5-1 and bend one end of the ground lug at a 90° angle as shown. Do not bend this lug at the mounting hole.

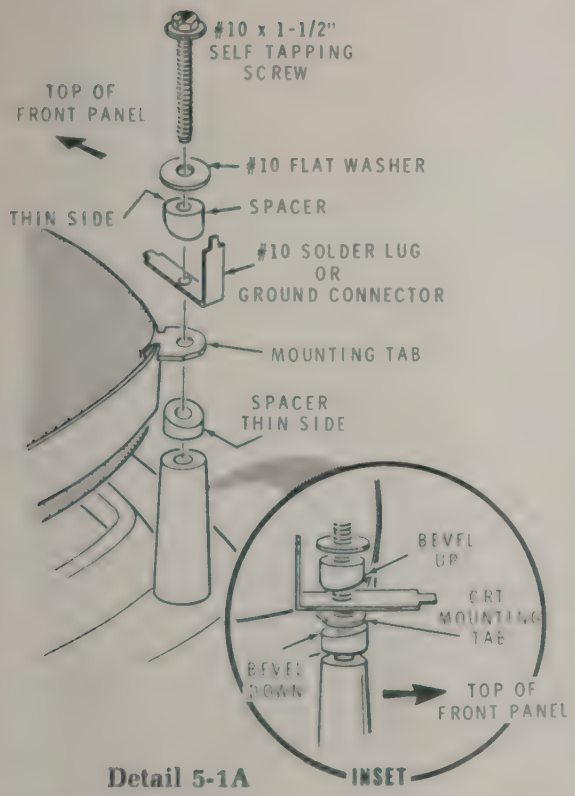
NOTE: When you install the beveled spacers in the next step, be sure to position their beveled sides toward each other.

( ) Refer to Detail 5-1A and mount the CRT mounting tab to the front panel at CE with the hardware from the previous step. Do not tighten this hardware.

( ) In the same manner mount the CRT mounting tab at the other three corners of the CRT except use a #10 solder lug at each location in place of the ground lug.

( ) Refer to the inset drawing on Detail 5-1A and position the bevel of the spacers at CE as shown. Also refer to Pictorial 5-1 and position the ground lug as shown. Then tighten the hardware.

( ) In the same manner, position the spacers and solder lugs at the other three corners of the CRT and tighten the hardware.




**Detail 5-1A**

( ) Connect the hooked end of a spring to solder lug CF and connect another spring to CG.

( ) Insert one end of the bare wire through the **upper hole** in the ground connector at CE for a length of a 1-1/2" and wrap it back around itself to secure it. Then solder the wire to the lug.

( ) Route the other end of this wire through the springs at CF and CG and through solder lug CH. Pull on the wire until both springs are stretched slightly. Then securely fasten the wire back on itself at CH. Cut off the excess bare wire.

( ) Locate the yoke and trim the bare wire ends to 1/8".

( ) Crimp and solder a large spring connector to the end of each yoke lead.

( ) Insert the spring connector on the blue yoke lead into hole 4 of a 4-hole connector shell.

( ) In the same manner, insert the red yoke lead into hole 2 of the same connector shell.

( ) Insert the spring connector on the yellow yoke lead into hole 1 of another 4-hole connector shell.

( ) In the same manner, insert the brown yoke lead into hole 3 of the same connector.

( ) Slide the yoke over the neck of the CRT with the leads coming from the yoke as shown. Push the yoke firmly against the flared part of the CRT.

( ) Tighten the yoke clamp screw only enough to keep the yoke from moving freely on the neck of the CRT.

Refer to Pictorial 5-2 (Illustration Booklet, Page 14) for the following steps.

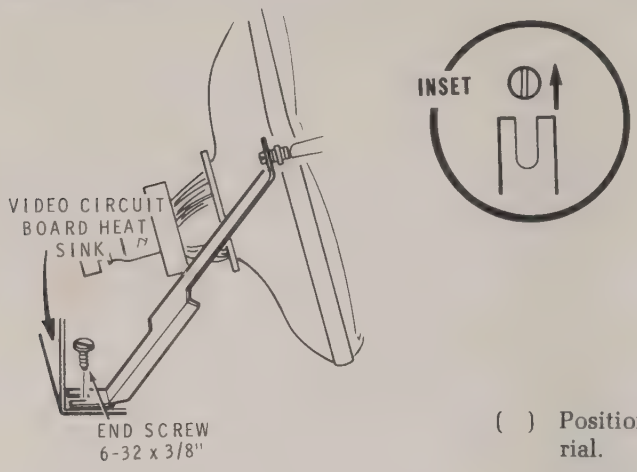
( ) Position the front of the terminal base over the edge of your work surface far enough so you can reach the mounting holes underneath. Be careful that you do not extend the base too far over the edge.

( ) Locate four 10-32 x 1" screws, four #10 flat washers, and two front panel mounting plates. Use this hardware in the following step.

NOTE: It is advisable to have someone help you mount the front panel in the following steps.

( ) Set the front panel into the terminal base and secure it with the hardware from the previous step. Install all of the hardware before you tighten it. Position the front panel as far forward as the hardware will permit. Then set the terminal base back on your work surface.

( ) Locate the free end of the 10" green wire coming from the solder lug on the power transformer. Solder this wire to solder lug CF at the lower corner of the CRT (see Pictorial 5-1).




**Detail 5-2A**

( ) Refer to Detail 5-2A and loosen the screw at CH and the 6-32 × 3/8″ screw at the left end of the video circuit board heat sink. Do not remove these screws.

( ) Refer to the inset drawing on Detail 5-2A and insert the lower end of the brace under the 6-32 × 3/8″ screw on the heat sink. Insert the other end of the brace under the screw at CH. Tighten both screws.

Set the cabinet base aside temporarily and proceed to "Keyboard Assembly."

## KEYBOARD ASSEMBLY

Refer to Pictorial 5-3 (Illustration Booklet, Page 14) for the following steps.

( ) Position the circuit board with the foil side facing up. Make sure there are two pins present at each key location under the keyboard. If a pin is missing at any of the designated hole locations, remove the keyboard mounting hardware, straighten the bent pin, and replace the keyboard. After you check all of the pad locations for pins, solder the pins to the foil.

( ) Position the keyboard facing up as in the Pictorial.

( ) Mount the 4-key keypad (Off Line-f1-f2-f3) at location A with a #4 × 3/8″ self-tapping screw. Position the keypad as shown and solder the pins to the foil.

( ) Mount the 4-key keypad (f4-f5-Erase-Blue) at location B with two #4 × 3/8″ self-tapping screws. Position the keypad as shown and solder the pins to the foil.

( ) Mount the 4-keypad (Red-White-Reset-Break) at location C with two #4 × 3/8″ self-tapping screws. Position the keypad as shown and solder the pins to the foil.

( ) Mount the 12-key keypad at location D with four #4 × 3/8″ self-tapping screws. Position the keypad as shown and solder the pins to the foil.

( ) Mount the 34-pin plug at location E. Insert the right angle pins through the circuit board holes and solder the pins to the foil.

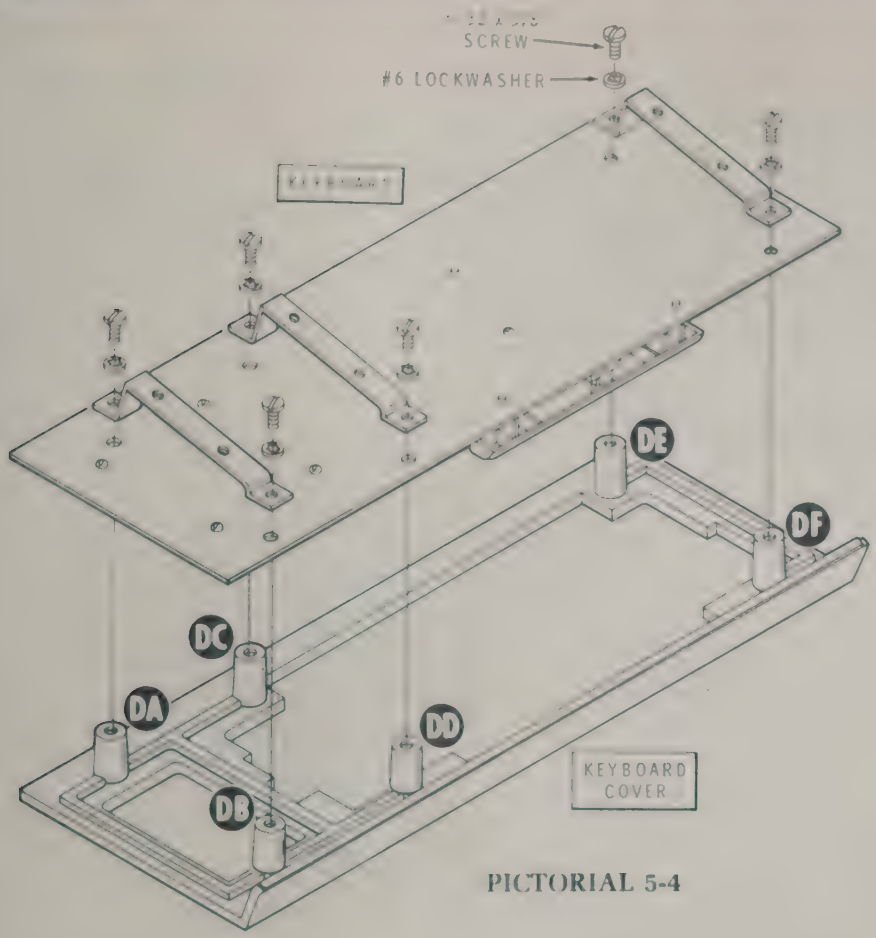
## CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions:

( ) Unsoldered pin connections.

( ) Poor solder connections.

( ) Solder bridges between foil patterns.




PICTORIAL 5-4

## KEYBOARD INSTALLATION

Refer to Pictorial 5-4 for the following steps.

( ) Locate the keyboard cover and place it painted side down on a soft cloth.

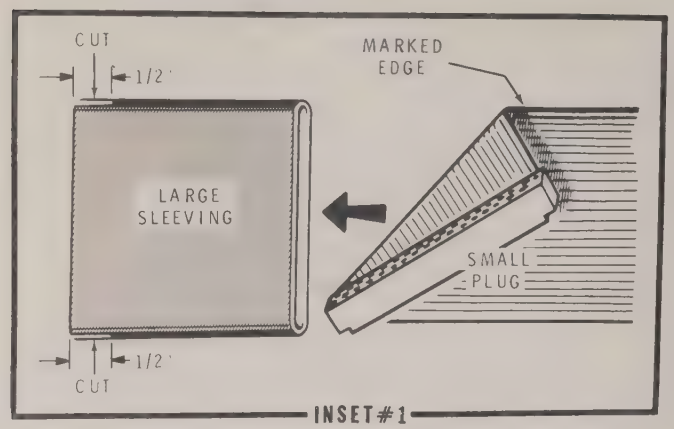
( ) Install brass inserts into the bosses at DA, DB, DC, DD, DE and DF.

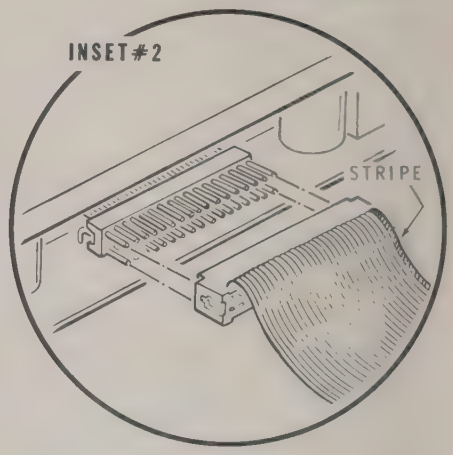
( ) Place the keyboard in the keyboard cover. Then mount a keyboard bracket at DE and DF with two 6-32 × 3/8" screws and two #6 lockwashers. Do not tighten this hardware.

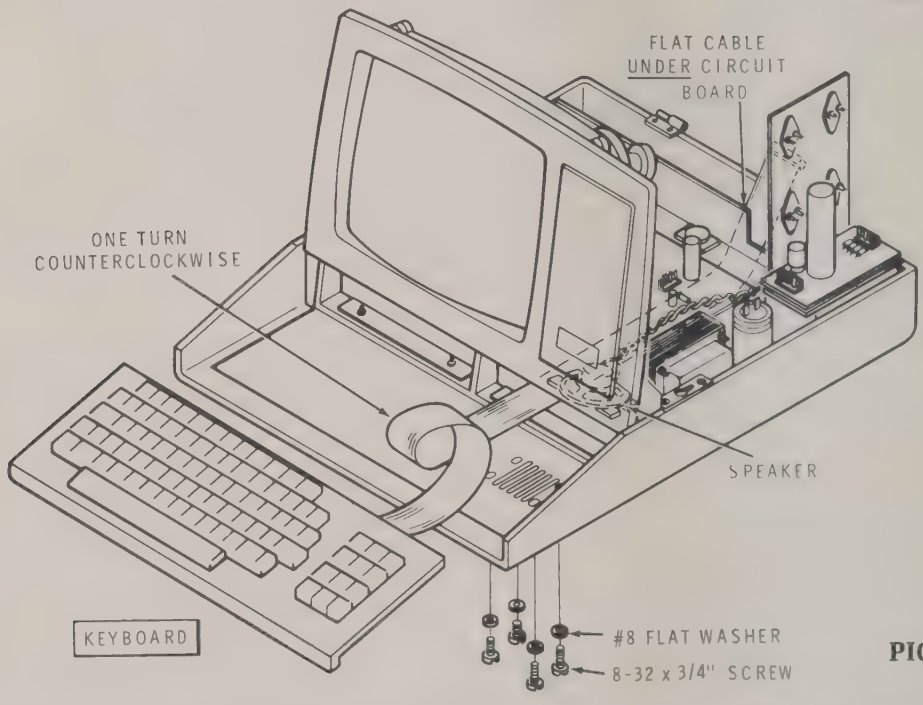
( ) In the same manner, install a keyboard bracket at DA and DB. Do not tighten this hardware.

( ) Install a keyboard bracket at DC and DD. Gently tighten the hardware on all three brackets.

( ) Push all of the keys nearest the keyboard cover and check for freedom of movement. If any of the keys bind against the keyboard cover, loosen the screws in the keyboard brackets and reposition the cover. Then tighten the screws.




**PICTORIAL 5-5**

Refer to Pictorial 5-5 for the following steps.

( ) Locate the large sleeving and make two 1/2" cuts in it at one end (see inset drawing #1).

( ) Refer again to inset drawing #1 and twist one end of the cable. Then slide the **uncut** end of the sleeving over the cable. Flatten the cable out again and slide the sleeving down to the connector.

( ) Refer to inset drawing #2 on Pictorial 5-5 and push the non-sleeving end of the flat cable onto plug P301 on the keyboard. Note the stripe along the edge of the cable. The sleeving should be at the other end of this cable.

( ) Set the keyboard in front of the terminal as shown. Then twist the flat cable one full turn counterclockwise.

( ) Route the end of the flat cable through the opening in the front panel and under the video circuit board.

( ) Mount the keyboard to the terminal base with six 8-32 × 3/4" screws and six #8 flat washers.

## SPEAKER INSTALLATION

Refer to Detail 5-5A for the next eight steps.

1. ( ) Locate the brown wire and cut it into two equal lengths. Then twist these two wires together to form a twisted pair.

2. ( ) Remove 1/8" of insulation from one end of each brown wire and 1/4" of insulation from the other end. Apply a small amount of solder to the bare wire ends to hold the fine wire strands in place.

3. ( ) Crimp and solder small spring connectors onto the 1/8" ends of the twisted pair.

4. ( ) Insert the spring connectors into a 3-hole connector shell as shown.

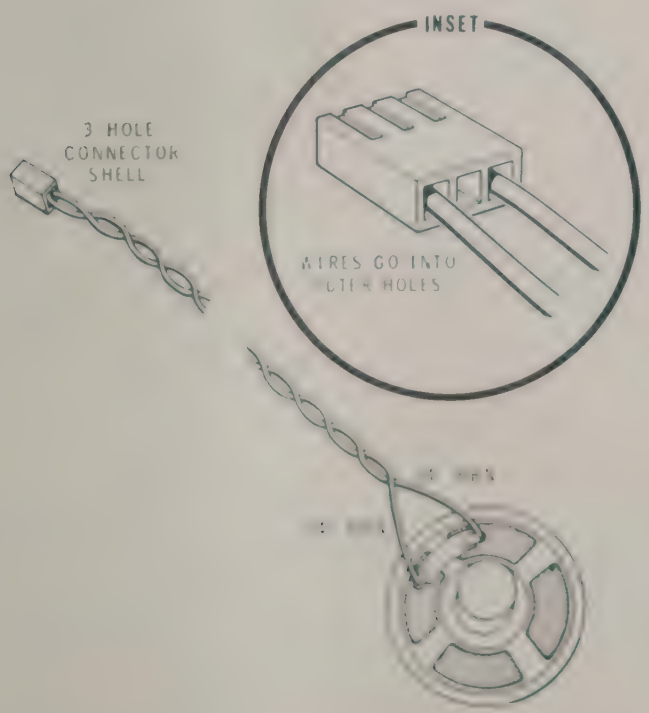
5. ( ) Solder the other end of the twisted pair to the speaker lugs. It does not matter which wire goes to which lug.

6. ( ) Locate the 3/4" × 5" foam gasket and cut it into two equal lengths.

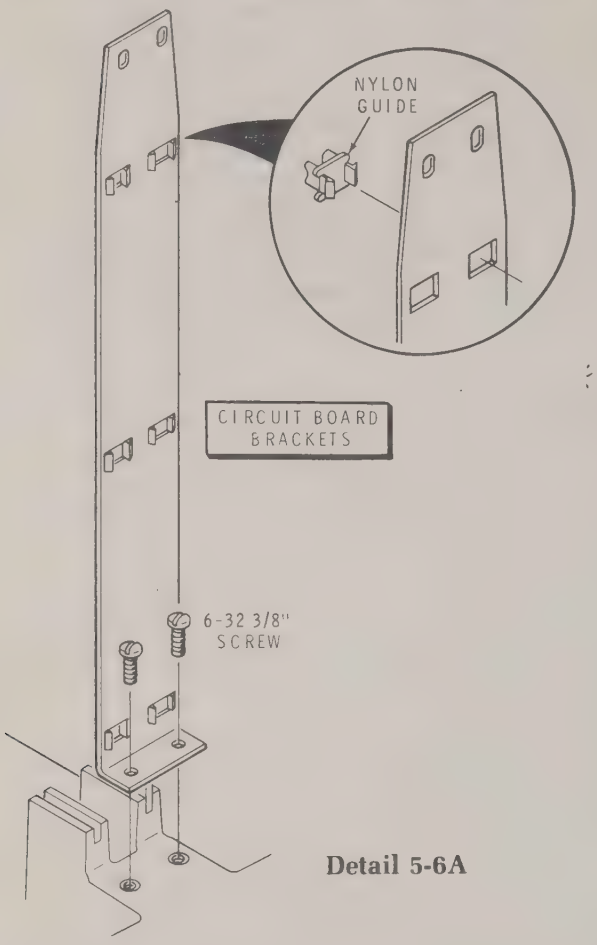
7. ( ) Remove the protective paper backing from one side of both foam gaskets and press the gaskets to the cone side of the speaker. It does not matter if the gasket sticks to the paper cone; however, do not press on the paper cone.

8. ( ) Remove the protective paper backing from the other side of the foam gasket. Then press the speaker to the back of the front panel just forward of the power transformer.

( ) Route the speaker wires along the video circuit board toward the rear panel and under the video circuit board heat sink.




**Detail 5-5A**




**Detail 5-6A**

## TERMINAL LOGIC AND CPU LOGIC CIRCUIT BOARD INSTALLATION

Refer to Pictorial 5-6 (Illustration Booklet, Page 15) for the following steps.

( ) Locate two circuit board brackets and twelve nylon guides.

( ) Refer to Detail 5-6A and install these nylon guides into each bracket.

( ) Refer again to Detail 5-6A and mount the brackets in the base with four 6-32 × 3/8" screws.

( ) Locate the interconnect cable (9-wire cable with 15-hole connectors on each end). Insert small polarization plugs into hole 2 (empty hole next to the black wire) in the socket at both ends of the cable. Lay this cable in the base as shown. It will be connected later.

( ) Locate the prewired terminal logic circuit board. Then refer to Detail 5-6C and set the sliders on S401 as shown.

( ) Set all of the sliders on S402 to their "0" positions.

( ) Position the terminal logic circuit board with its component side toward the front and the heat sink on top. Then slide it down into the rear set of nylon guides. Set the bottom of the board into the grooves in the base.

( ) Push the connector on the end of the twisted speaker wires onto plug P402 on the logic circuit board.

( ) Push the connector on the flat cable onto plug P403 on the logic circuit board. Make sure the cable is positioned with the stripe away from the edge of the circuit board.

( ) Refer to the inset drawing on Pictorial 5-6 and cut pin 2 off plug P404. Remove the pin close to the body of the plug.

( ) Refer to the inset drawing on Pictorial 5-6 and push the back connector of the interconnect cable onto plug P404 (on the foil side of the terminal logic circuit board). Make sure the pin 1 end of the connector (black wire) is positioned up.

( ) Secure the circuit board heat sink to the circuit board brackets with two 6-32 × 3/8" screws.

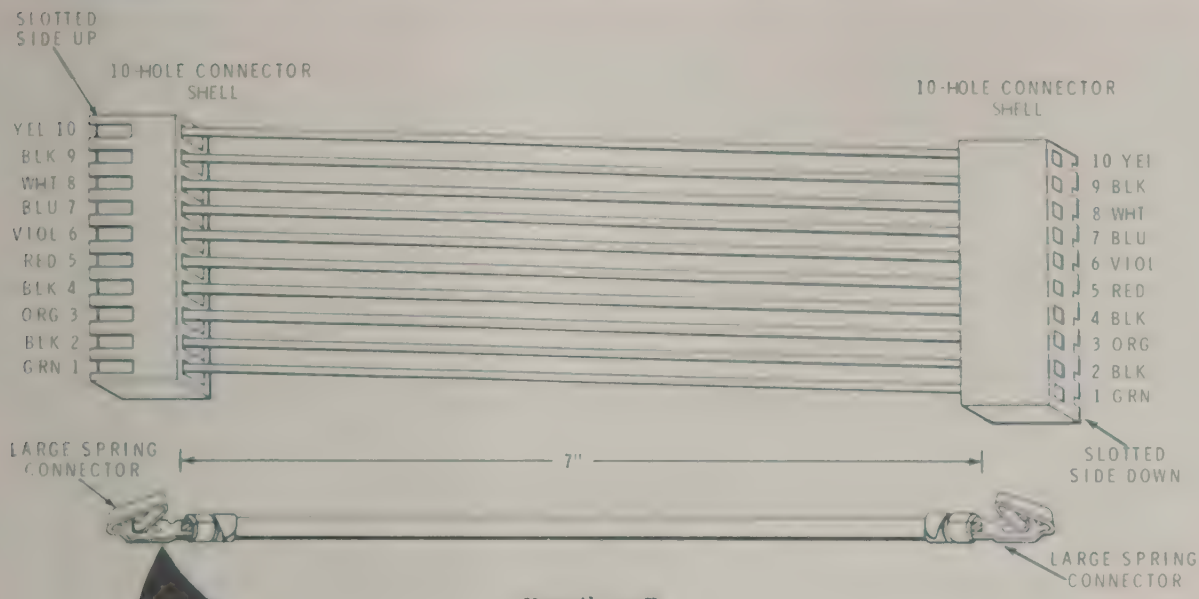
( ) Prepare the following stranded wires. Remove 1/8" insulation from both ends of each wire.

| | |
|---|---|
| 7" green | 7" violet |
| 7" black | 7" blue |
| 7" orange | 7" white |
| 7" black | 7" black |
| 7" red | 7" yellow |

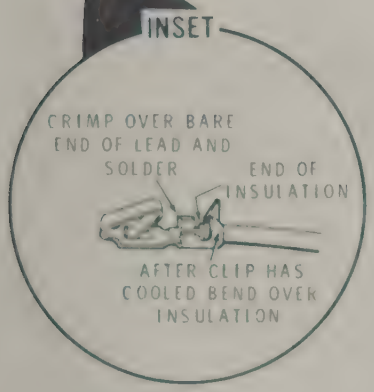
( ) Refer to Detail 5-6B and crimp and solder large spring connector onto both ends of each wire.

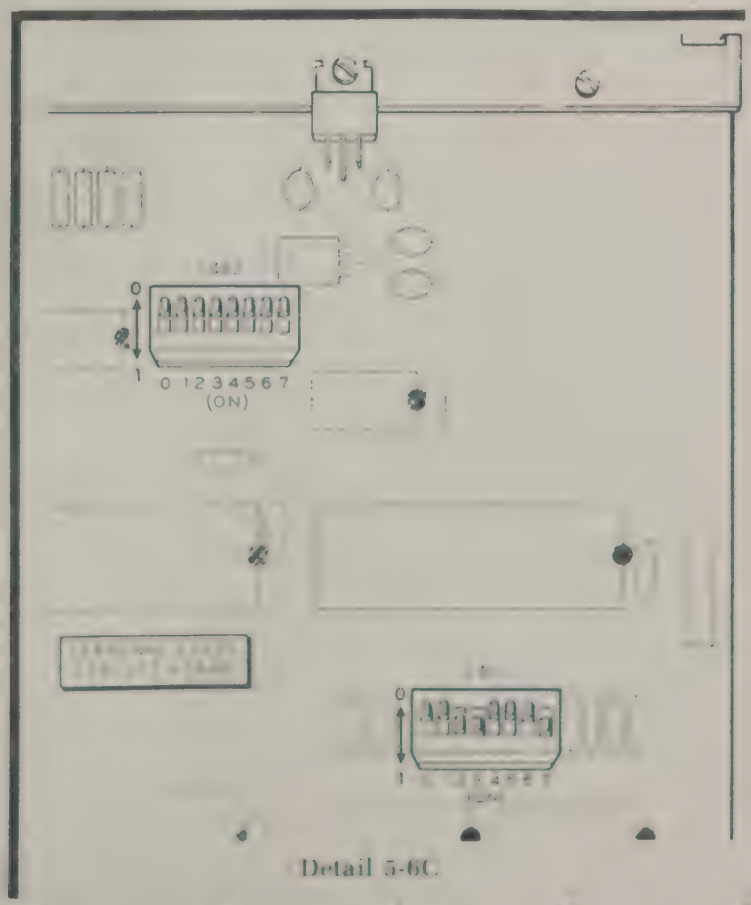
( ) Again refer to Detail 5-6B and insert the prepared wires into two 10-hole connector shells as shown.

( ) Connect one end of the 7" cable that you just prepared onto plug P401. The other end of this cable will be connected later.

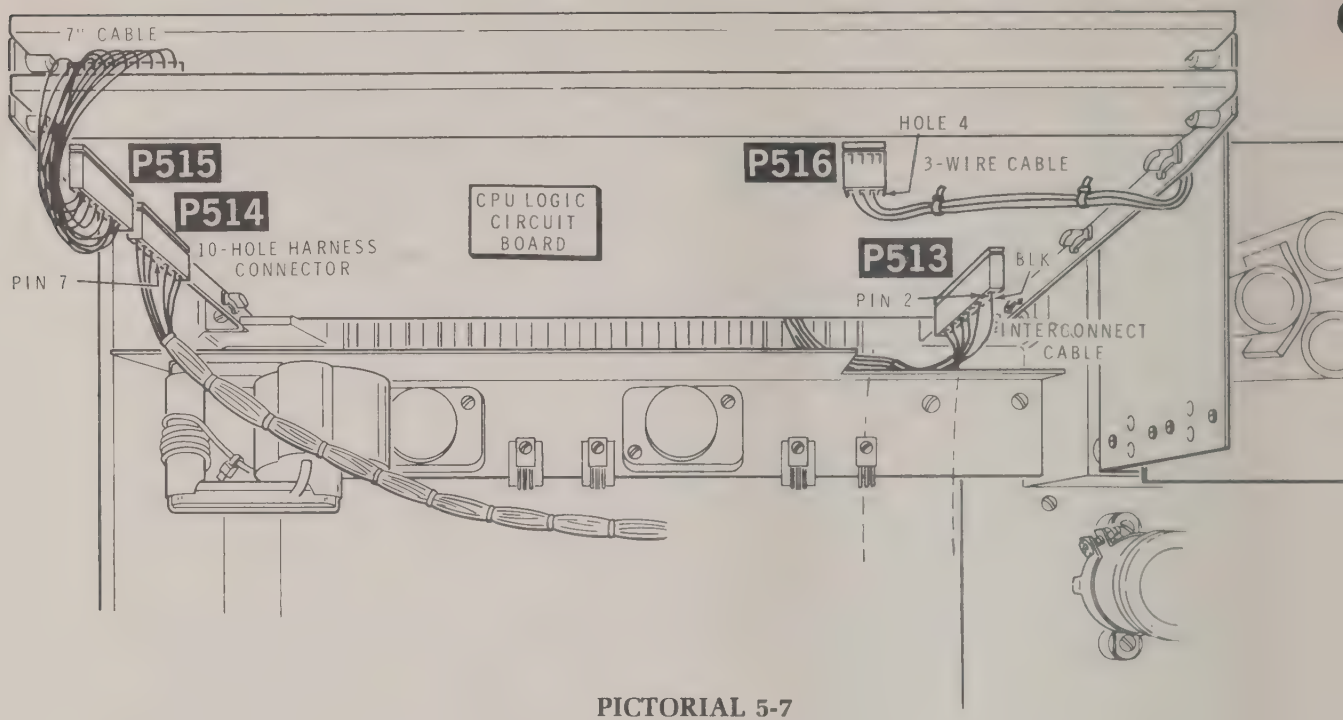



Detail 5-6B




Detail 5-6C




**PICTORIAL 5-7**

Refer to Pictorial 5-7 for the following steps.

( ) Locate the wired CPU logic circuit board and cut pin 2 off plug P513.

( ) Position the wired CPU logic circuit board with its component side forward. Then slide it down into the second set of nylon guides in the circuit board brackets.

( ) Connect the other end of the 7" cable (coming from the terminal logic circuit board) to plug P515 on the CPU logic circuit board.

( ) Locate pin 7 of plug P514 and cut it off close to the plug body.

( ) Locate the 10-hole connector on the harness, and insert a large polarization plug into hole 7.

( ) Connect the 10-hole connector on the harness to plug P514 on the CPU logic circuit board.

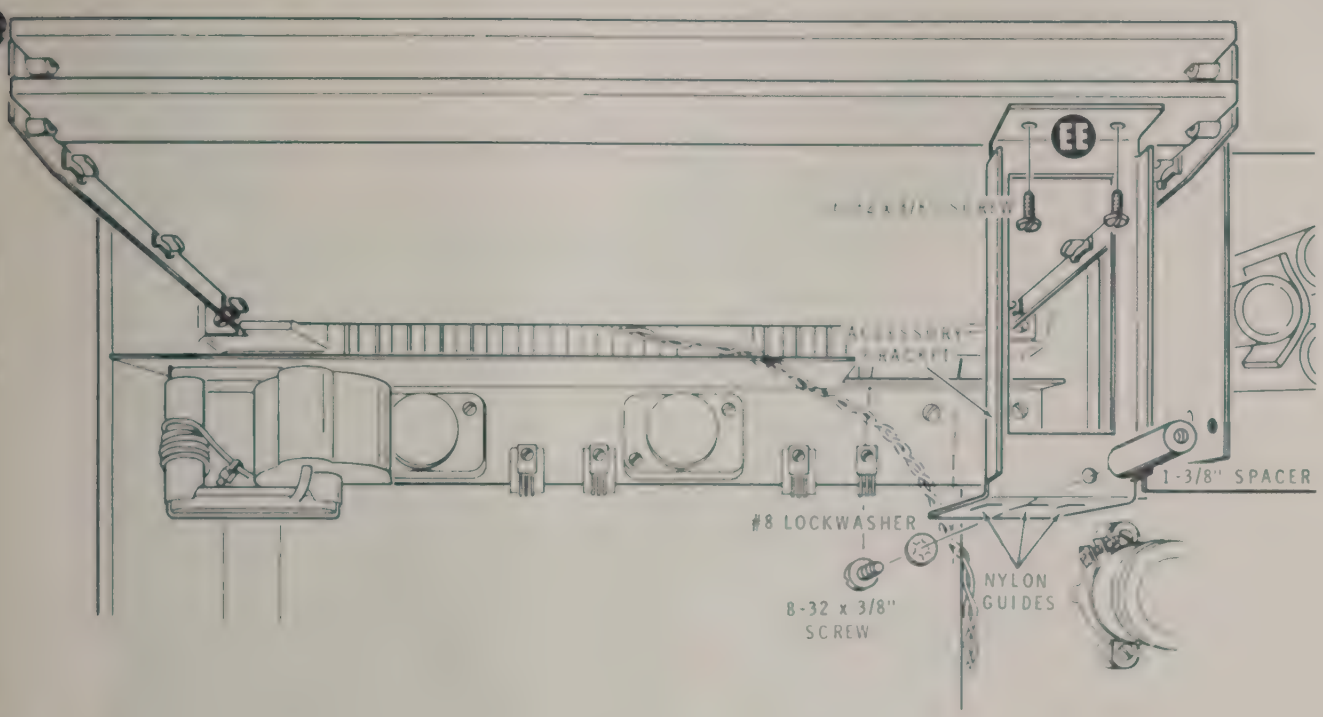
( ) Locate pin 4 of plug P516 and cut it off close to the plug body.

( ) Locate the 4-hole connector coming from the power supply heat sink and insert a large polarization plug in hole 4.

( ) Connect the 4-hole connector (3-wire cable coming from the power supply heat sink) to plug P516 on the CPU logic circuit board.

( ) Connect the other end of the interconnect cable to plug P513 on the CPU logic circuit board. Be sure to position the black wire up.

( ) Secure the CPU logic circuit board heat sink to the circuit board brackets with two 6-32 × 3/8" screws.




**PICTORIAL 5-8**

Refer to Pictorial 5-8 for the following steps.

[ ] Locate an accessory mounting bracket and three nylon guides. Install the nylon guides in the bracket from the inside.

[ ] Mount the 1-3/8" spacer to the top side of the bracket as shown with an 8-32 × 3/8" screw and a #8 lockwasher.

[ ] Mount the accessory mounting bracket to the CPU logic circuit board heat sink at EE. Use two 6-32 × 3/8" screws.

# VIDEO ADJUSTMENTS

Refer to Pictorial 6-1 (Illustration Booklet, Page 15) for the following steps.

( ) Push the 4-hole socket with the blue and red wires onto plug P204 on the video circuit board.

( ) Push the 4-hole socket with the brown and yellow wires onto plug P201 on the video circuit board.

( ) Push the 8-hole socket coming from the flyback transformer onto plug P203 on the video circuit board.

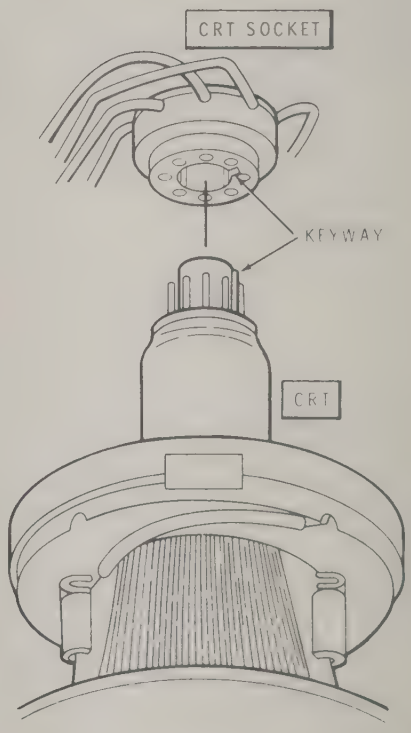
**WARNING: It is extremely important that the black GND wire that will be connected in the next step, always be connected whenever the unit is in operation. To apply power to the unit without this wire connected will result in a very dangerous high voltage situation.**

( ) Push the connector on the end of the black GND wire onto the solder lug at CE.

( ) Remove and discard the plastic pin protector from the CRT pins.

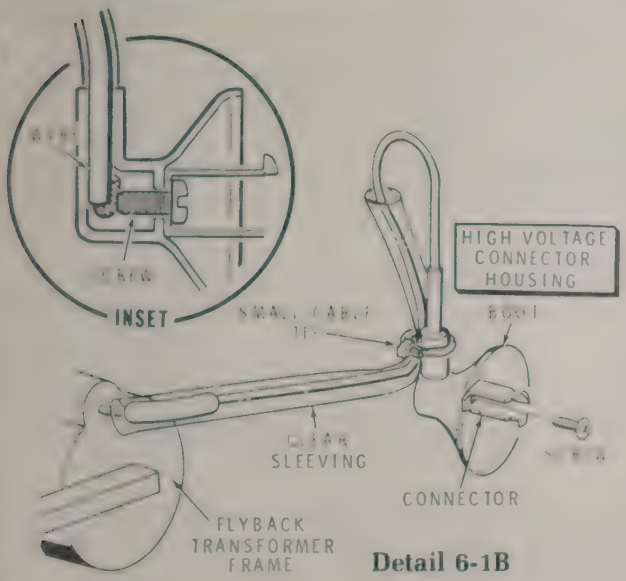
( ) Refer to Detail 6-1A and line up the keyway in the CRT socket with the key on the CRT. Then carefully push the socket onto the CRT.

( ) Route the CRT socket leads down to the video board and away from the high voltage transformer.




**Detail 6-1A**

( ) Temporarily connect one end of the remaining black wire to the solder lug at CE. Then touch the other end of this wire to the anode socket on the CRT to discharge any stored-up charge. Then remove the wire.




**Detail 6-1B**

Refer to Detail 6-1B for the next four steps.

( ) Remove the screw and connector from the high voltage connector housing.

( ) Pull the high voltage lead out of the connector housing.

( ) Slide the length of large clear sleeving over the high voltage lead. Position the sleeving down to the flyback transformer.

NOTE: When you reinstall the high voltage lead in the next step, position the bare wire so that the screw will make contact with the wire when it is reinstalled. See the inset drawing on Detail 6-1B.

( ) Insert the high voltage lead into the housing as far as it will go. Then reinstall the connector and screw. Do not install the cable tie at this time.

( ) Refer to the inset drawing on Pictorial 6-1 and install the high voltage lead in the anode socket. Position the connector housing so that the lead is up (exits toward the top of the CRT).

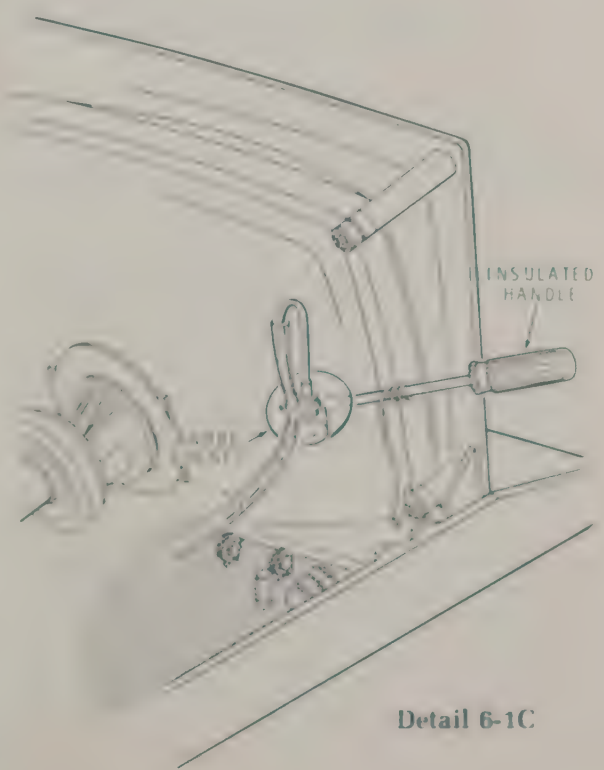
( ) Refer again to Detail 6-1B and form a loop in the high voltage lead as shown. The object of this loop is to position the high voltage lead away from the flyback transformer frame. Then install a small cable tie around the lead and the connector housing.

WARNING: The voltage on the high voltage lead is very high (especially next to the high voltage transformer) and will arc to any other wires near it. Refer to Pictorial 6-1 and position all other leads away from the high voltage lead and the high voltage transformer. Also make sure the high voltage lead is not against the brace.

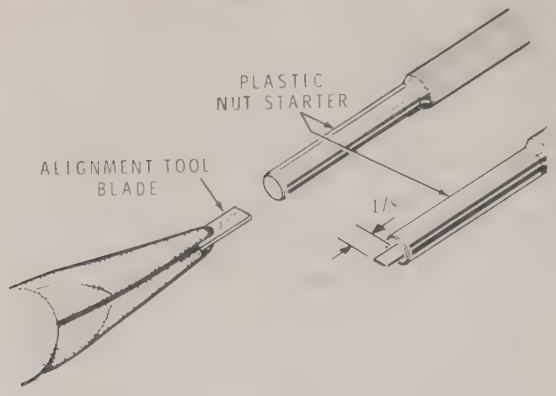
NOTE: If it ever becomes necessary to remove the high voltage lead from the CRT, refer to Detail 6-1C and proceed as follows:

1. First discharge the CRT. This is important, since the high voltage present at the CRT anode is dangerous. Connect one end of a wire to the solder lug at CE and connect the other end to a small-blade screwdriver. Then slip the screwdriver under the plastic boot on the high voltage connector to make contact with the anode socket. CAUTION: Do not touch anything with your other hand while you perform this step.

2. Fold the plastic boot back and use a screwdriver to push one of the high voltage clips towards the other. This will permit you to remove the connector.




**Detail 6-1C**




**Detail 6-1D**

( ) Refer to Detail 6-1D and push the alignment tool blade into the small end of the nut starter. Leave 1/8" of the blade protruding as shown. Use this tool to turn circuit board controls.

( ) Refer to Pictorial 6-1 (Illustration Booklet, Page 15) for the location of controls on the video circuit board.

( ) Set the BRIGHTNESS control on the video circuit board fully counterclockwise as viewed from the left side of the terminal base.

( ) Set the other controls on the video circuit board to their center of rotation.

( ) Push the 6-hole harness connector onto plug P202 on the video circuit board.

WARNING: When power is applied to the circuits, avoid contact with the flyback transformer, the high voltage lead, or the anode socket in the back of the CRT, as it is possible to receive an electrical shock from these areas. Also, to lessen the chances of an electrical shock while you are making adjustments, keep one hand away from the unit and all other metallic objects.

CAUTION: Whenever you turn the power on, make sure you wait at least 30 seconds or until you get a cursor or light raster on the screen before you turn the power off again. A quick turn on and off can damage the CRT.

( ) Connect the line cord to an AC outlet and set the POWER switch to ON.

( ) After a few minutes, a light raster should appear on the screen. If it does not, adjust control G1 to cause the raster to appear. NOTE: The raster may be slanted at this time.

( ) Grasp the yoke on the back of the CRT and slowly turn the yoke to properly line up the raster on the screen.

( ) Adjust the VERT SIZE control on the video circuit board so the raster is approximately 6" high.

( ) Refer to Pictorial 6-2 and rotate the ring magnets on the back of the yoke to center the display on the screen.

NOTE: The next adjustment should be made in a darkened room. If a darkened room is not available, shade the CRT screen.

( ) Turn control G1 clockwise until the raster just disappears.

( ) Set the OFF LINE and CAPS LOCKS keys to their down position.

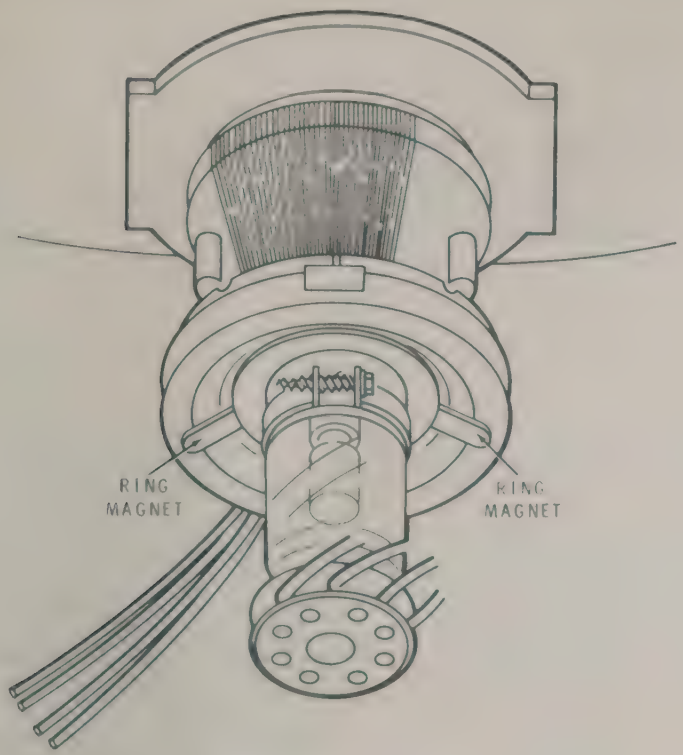
( ) Adjust the BRIGHTNESS control until the blinking cursor (underline) appears.

NOTE: If the cursor is approximately 1/8" long and positioned near the upper left, disregard the next step. If the cursor is longer and not at the left side of the screen, proceed with the next step.

( ) Turn the HORIZ CENTERING control on the video circuit board counterclockwise (as viewed from the left side) until the cursor moves all the way left and then just begins to move right again. Then turn the control counterclockwise until the cursor is positioned approximately 1/4" in from the left edge of the raster.

( ) Hold the "Z" key and the REPEAT key down to produce a full line of characters across the screen. If the line of characters tend to fold over at one edge of the screen, it will be corrected in the next step.

( ) Adjust the HORIZ CENTERING control on the video circuit board to center the display horizontally.




PICTORIAL 6-2

( ) Push the RETURN key and then the LINE FEED key to restore the cursor to the left side of the screen and one line down.

( ) Again hold the "Z" key and the REPEAT key to produce another full line of characters.

( ) Repeat this procedure until the last line of characters is erased each time you push the LINE FEED key. This indicates that you have a full display.

( ) Adjust the VERT LINEARITY control on the video circuit board so the top and bottom row of characters are of uniform size.

( ) If the display width is not approximately 8-1/2", adjust the WIDTH coil (L204) to correct the width.

( ) Adjust the BRIGHTNESS control (R216) to obtain the brightness which is most suitable to you.

( ) Adjust FOCUS control R271 for the best focus over the entire screen.

( ) Recheck the display for proper alignment of the screen. If necessary, rotate the yoke a small amount. Then tighten the yoke clamp screw only enough to hold the yoke from turning.

( ) Set the POWER switch to OFF and disconnect the line cord.

This completes the video adjustments. Proceed to "Final Assembly."

# POSSIBLE CIRCUIT BOARD PROBLEMS

**NOTE: Disregard this section unless you have a problem on a circuit board.**

The components listed in the "Possible Area of Trouble" column only indicate an area. This means that the component listed may be faulty, or another component or part of the circuit associated with this component may be faulty. The causes of trouble most often found are listed below. Check these possibilities carefully.

1. Solder bridges between two different foil pads. If the solder is bridged between two connections on the same foil, it is all right.

2. Diodes installed backward. Some diode bands are difficult to see. A diode that is installed backward will not operate properly.

3. Transistors installed backward. A transistor that is installed backward will not operate properly.

4. Diodes or transistors installed in the wrong location. Refer back to the steps where these components were installed and check the part numbers.

5. Electrolytic capacitors installed backward. Make sure that the plus (+) or minus (−) marks on the capacitor correspond to the markings on the circuit board.

6. IC's incorrectly installed in their sockets. An IC pin may be bent under the IC instead of inserted into the socket hole. An IC that is installed backward will not operate properly.

7. Capacitors (mica, ceramic or Mylar) may be the wrong value. For instance, it is easy to install a 500 pF capacitor in place of a .005 $\mu$F.

If you cannot resolve your problems here, refer to the "Troubleshooting" section in the "Operation Manual" on Page 8-1.

# FINAL ASSEMBLY

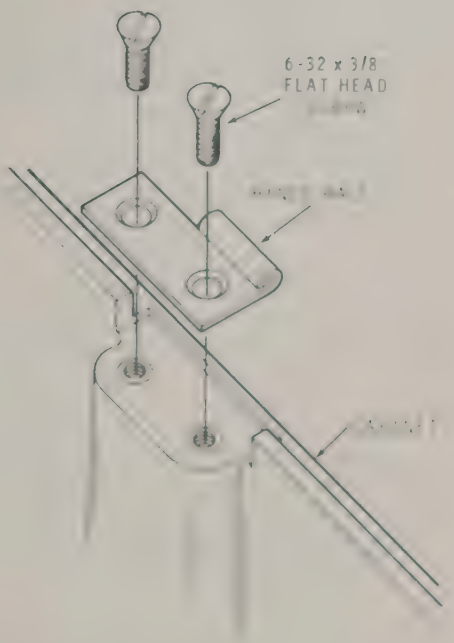
Refer to Pictorial 7-1 (Illustration Booklet, Page 16) for the following steps.

( ) Install brass inserts in the cabinet at EA, EB, EC, and ED.

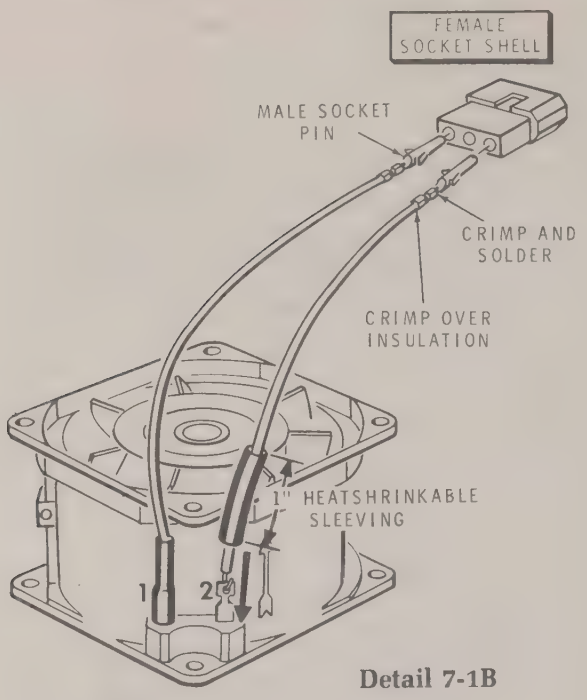
( ) Apply Vibra-Tite sealant to the inside threads of the inserts at EC and ED.

( ) Refer to Detail 7-1A and mount a hinge half to the cabinet at EA. Use two 6-32 × 3/8" flat head screws.

( ) In the same manner, mount a hinge half to the cabinet at EB.




**Detail 7-1A**




**Detail 7-1B**

Refer to Detail 7-1B for the following steps.

( ) Prepare two 6" red stranded wires (thick insulation). Do not apply solder to one end of each wire.

( ) Crimp and solder male socket pins onto the soldered end of each wire.

( ) Insert these pins into the two outside holes in a female socket shell.

( ) Slide a 1" length of heat shrinkable sleeving over the other end of each red wire.

NOTE: In the next step, tightly twist the fine wire strands before you insert the end of the wire through the lug.

( ) Connect either red stranded wire to lug 1 of the fan (S-1).

( ) Connect the other red wire to lug 2 of the fan (S-1).

( ) Slide the sleeving on each wire down over its lug. Then use a heat source such as a hair dryer or light bulb to apply heat to the sleeving to cause it to shrink.

( ) Install brass inserts in the cabinet at EG, EM, EJ, and EK.

( ) Note the arrow on the side of the fan. This arrow indicates the direction of air flow. In the next step, mount the fan so that the air flow is out through the top of the cabinet. (The cabinet is positioned up side down at this time.)

( ) Locate the following hardware. Use this in the following next step.

| | |
|---|---|
| 1 | Fan mounting plate |
| 4 | 6-32 × 3/8" screws |
| 2 | 6-32 × 1-7/8" screws |
| 2 | #6 lockwashers |
| 2 | 6-32 nuts |

( ) First mount the fan to the fan mounting plate; then mount the fan in the cabinet. Use the hardware from the previous step. Position the wires in the corner as shown. Do not overtighten the long screws.

( ) Refer to the inset drawing on Pictorial 7-2 and install detent screws with # 6 flat washers and O-rings into the cabinet shell at EC and ED.

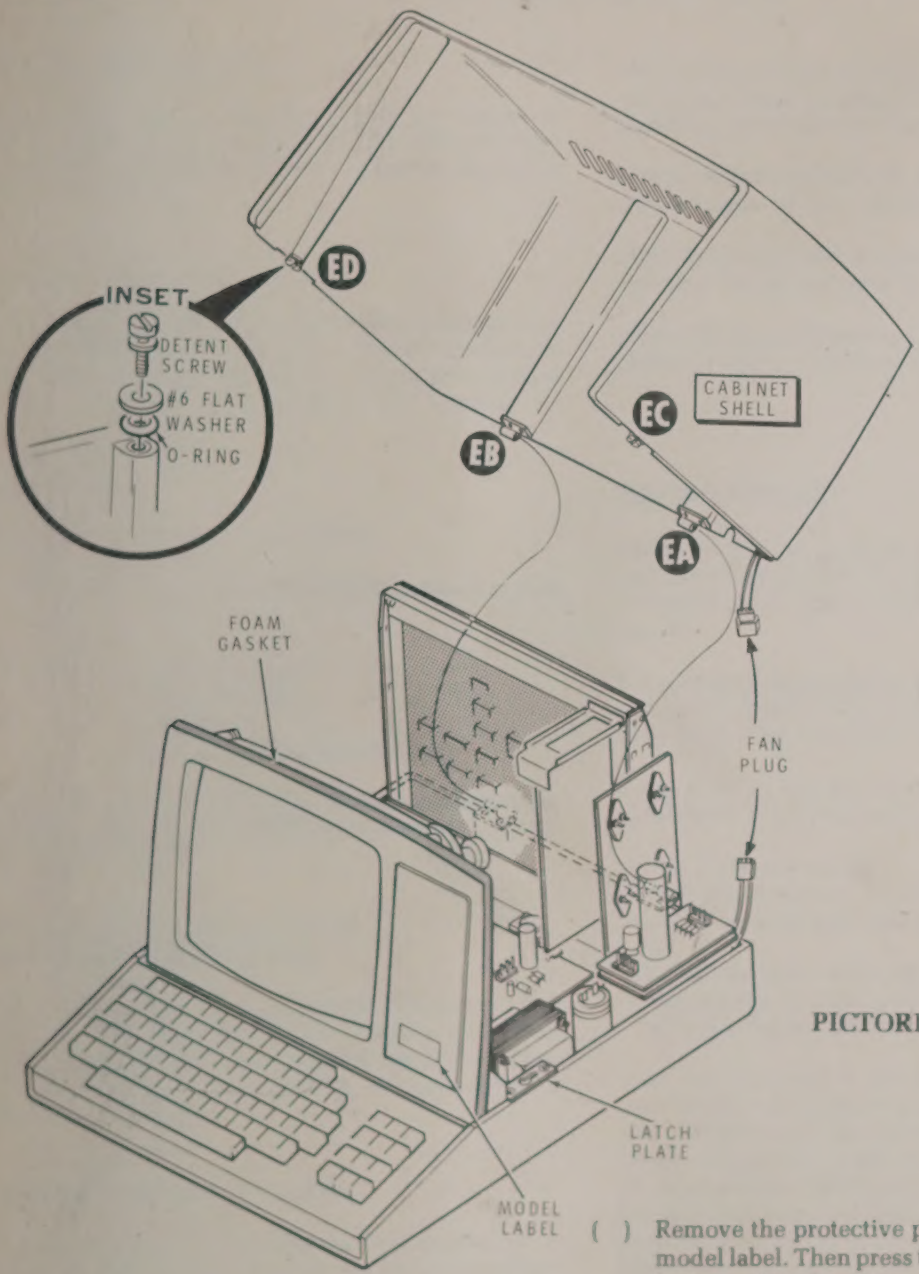
Refer to Pictorial 7-2 for the following steps.

( ) Locate the long foam gasket and peel the protective paper from one end for a length of approximately 3". Peel more paper off as you install the gasket.

( ) Starting at the base on the right side, press the gasket to the edge of the front panel. Proceed around the front panel edge to the base on the other side. Cut off any excess foam gasket.

( ) Position the cabinet over the terminal and slide the cabinet hinge halves onto the hinge halves on the terminal base.

( ) Connect the fan plug to the fan socket.




PICTORIAL 7-2

( ) Make sure the latch plates are positioned back as far as they will go. Then lower the front of the cabinet shell so that the detent screws enter the holes in the latch plate.

( ) Use a small screwdriver to slide the latch plate forward. If the latch plate is too tight or too loose, raise the cabinet and loosen or tighten the latch plate screw.

( ) Remove the protective paper backing from the model label. Then press the label onto the lower bottom of the bezel cover on the front panel.

( ) Remove the protective paper backing from the blue and white label. Then press the label to the back of the terminal base beside the connector plate. Refer to the numbers on this label in any communications you may have with the Heath Company concerning this kit.

This completes the assembly of your Computer. Proceed to the Operation Manual.

# CUSTOMER SERVICE

## REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

### ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

**Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.**

### OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

## TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

**Please do not send parts for testing,** unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

## REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

**If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.**

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

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Benton Harbor, Michigan 49022

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